Mathematics
Texas A&M University

Core Curriculum Cover Sheet

Initial Request for a course to be considered for the Fall 2014 Core Curriculum

1. This request is submitted by (department name): Mathematics

2. Course prefix and number: Math 131

3. Texas Common Course Number: 

4. Complete course title: Mathematical Concepts - Calculus

5. Semester credit hours: 3

6. This request is for consideration in the following Foundational Component Area:
   - Communication
   - Creative Arts
   - Mathematics
   - American History
   - Life and Physical Sciences
   - Government/Political Science
   - Language, Philosophy and Culture
   - Social and Behavioral Sciences

7. This course should also be considered for International and Cultural Diversity (ICD) designation:
   - Yes
   - No

8. How frequently will the class be offered? Fall, Spring, Summer

9. Number of class sections per semester:
   - Fall average= 4
   - Spring average= 6
   - Summer average= 2

10. Number of students per semester:
    - Fall average= 385
    - Spring average= 432
    - Summer average= 47
    - 2011-2012
    - 2010-2011
    - 2009-2010

11. Historic annual enrollment for the last three years:
    - 2011-2012: 840
    - 2010-2011: 893
    - 2009-2010: 859

This completed form must be attached to a course syllabus that sufficiently and specifically details the appropriate core objectives through multiple lectures, outside activities, assignments, etc. Representative from department submitting request should be in attendance when considered by the Core Curriculum Council.

13. Submitted by:
    - [Signature]

14. Course Instructor

15. Approvals:

16. Department Head

17. College Dean/Designee

Date

For additional information regarding core curriculum, visit the Texas Higher Education Coordinating Board website at www.thecb.state.tx.us/corecurriculum2014

See form instructions for submission/approval process.

Associate Provost
for Undergraduate Studies

Texas A&M University
Texas A&M University

Core Curriculum

Initial Request for a Course Addition to the Fall 2014 Core Curriculum

Foundational Component Area: Mathematics

In the box below, describe how this course meets the Foundational Component Area description for Mathematics. Courses in this category focus on quantitative literacy in logic, patterns, and relationships. Courses involve the understanding of key mathematical concepts, and the application of appropriate quantitative tools to everyday experience.

The proposed course must contain all elements of the Foundational Component Area. How does the proposed course specifically address the Foundational Component Area definition above?

This course is focused on quantitative literacy in mathematics found in the natural and social sciences and everyday life. Upon successful completion of this course, students will be able to:

- Logically formulate mathematical variables and equations to quantitatively create mathematical models representing problems in everyday life.
- Recognize and construct graphs of basic functions, including polynomials, exponentials, logarithms, and trigonometric functions and use them to model real-life situations.
- Identify patterns in numeric data to calculate limits and derivatives of functions numerically.
- Compute limits of functions numerically, graphically, and algebraically.
- Justify whether a function is continuous or not using the mathematical definition of continuity.
- Compute derivatives using the limit definition of the derivative.
- Understand the derivative as a rate of change in order to quantitatively apply it to everyday life. For example, recognize that derivatives can be used to find the velocity and acceleration of an object given its position function.
- Compute derivatives of polynomials, rational, trigonometric, exponential, and logarithmic functions.
- Apply the product rule, quotient rule, and chain rule to take derivatives of compositions of functions.
- Compute the linear approximation of a function and use it in applications of approximation and error estimation.
- Investigate the relationship between a function and its first and second derivatives, and use the information obtained from its derivatives to identify pertinent information about the function.
- Find the local and absolute extrema of functions, including optimization applications such as minimizing the cost of fencing in a particular area of land.
- Compute antiderivatives and understand the concept of integration as it relates to area.
- Apply the definite integral to quantitatively determine solutions to problems in everyday life including areas between curves, average value of a function, and total distance traveled.
- Recognize and appreciate the derivative (rate of change) and the definite integral (accumulation of change) and utilize the Fundamental Theorem of Calculus as the bridge between the two.
- Apply the substitution method to compute integrals.

Core Objectives

Describe how the proposed course develops the required core objectives below by indicating how each learning objective will be addressed, what specific strategies will be used for each objective and how student learning of each objective will be evaluated.

The proposed course is required to contain each element of the Core Objective.

Critical Thinking (to include creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information):
Texas A&M University
Core Curriculum

Initial Request for a Course Addition to the Fall 2014 Core Curriculum

The following critical thinking skills will be assessed on various assignments which may include homework, quizzes, and/or exams:

- Students will analyze a function and justify whether or not it is continuous using the definition of continuity.
- Students will use inquiry to determine the best method for taking derivatives of complicated functions.
- Students will identify and categorize information about a function in order to construct a graph of its derivative.
- Students will apply calculus to find innovative ways to graph complicated functions without the aid of technology.
- Students will analyze and synthesize data and think creatively to develop mathematical models for optimization purposes.
- Students will examine how the Fundamental Theorem of Calculus connects differential and integral calculus.

Communication (to include effective development, interpretation and expression of ideas through written, oral and visual communication):

The following communication skills will be assessed on various assignments which may include homework, quizzes, and/or exams, as well as during lecture:

- Students will symbolically relay mathematical information and concepts by creating variables and writing equations.
- Students will recognize, construct, and interpret graphs of basic functions.
- Students will write mathematical information symbolically to describe the behavior of functions.
- Students will justify results that use mathematical definitions such as the definition of continuity.
- Students will explain verbally in class the connection between derivatives, rates of change, and slopes of tangent lines.
- Students will explain (both in writing and verbally) mathematical solutions to problems.

Empirical and Quantitative Skills (to include the manipulation and analysis of numerical data or observable facts resulting in informed conclusions):

The following empirical and quantitative skills will be assessed on various assignments which may include homework, quizzes, and/or exams:

- Students will evaluate limits numerically and use the information to draw conclusions about the behavior of a function.
- Students will calculate a derivative numerically and explain the result in the context of the problem.
- Students will manipulate empirical data to develop a mathematical model to use in an optimization problem and then apply calculus to find and interpret the optimal solution.
- Students will apply the Fundamental Theorem of Calculus to quantitatively compute the accumulated change of a quantity.

Please be aware that instructors should be prepared to submit samples/examples of student work as part of the future course recertification process.
Catalog Description

Limits and continuity, rates of change, slope; differentiation: the derivative, maxima and minima; integration: the definite and indefinite integral techniques; curve fitting. Prerequisites: High school algebra I and II and geometry. Credit will not be given for more than one of MATH 131, 142, 147, 151 and 171.

Learning Outcomes

This course is focused on quantitative literacy in mathematics found in the natural and social sciences and everyday life. Upon successful completion of this course, students will be able to:

- Logically formulate mathematical variables and equations to quantitatively create mathematical models representing problems in everyday life.
- Recognize and construct graphs of basic functions, including polynomials, exponentials, logarithms, and trigonometric functions and use them to model real-life situations.
- Identify patterns in numeric data to calculate limits and derivatives of functions numerically.
- Compute limits of functions numerically, graphically, and algebraically.
- Justify whether a function is continuous or not using the mathematical definition of continuity.
- Compute derivatives using the limit definition of the derivative.
- Understand the derivative as a rate of change in order to quantitatively apply it to everyday life. For example, recognize that derivatives can be used to find the velocity and acceleration of an object given its position function.
- Compute derivatives of polynomials, rational, trigonometric, exponential, and logarithmic functions.
- Apply the product rule, quotient rule, and chain rule to take derivatives of compositions of functions.
- Compute the linear approximation of a function and use it in applications of approximation and error estimation.
- Investigate the relationship between a function and its first and second derivatives, and use the information obtained from its derivatives to identify pertinent information about the function.
- Find the local and absolute extrema of functions, including optimization applications such as minimizing the cost of fencing in a particular area of land.
- Compute antiderivatives and understand the concept of integration as it relates to area.
- Apply the definite integral to quantitatively determine solutions to problems in everyday life including areas between curves, average value of a function, and total distance traveled.
- Recognize and appreciate the derivative (rate of change) and the definite integral (accumulation of change) and utilize the Fundamental Theorem of Calculus as the bridge between the two.
- Apply the substitution method to compute integrals.

Core Objectives

Critical Thinking

- Students will analyze a function and justify whether or not it is continuous using the definition of continuity.
- Students will use inquiry to determine the best method for taking derivatives of complicated functions.
- Students will identify and categorize information about a function in order to construct a graph of its derivative.
- Students will apply calculus to find innovative ways to graph complicated functions without the aid of technology.
- Students will analyze and synthesize data and think creatively to develop mathematical models for optimization purposes.
- Students will examine how the Fundamental Theorem of Calculus connects differential and integral calculus.

Communication Skills

- Students will symbolically relay mathematical information and concepts by creating variables and writing equations.
- Students will recognize, construct, and interpret graphs of basic functions.
- Students will write mathematical information symbolically to describe the behavior of functions.
- Students will justify results that use mathematical definitions such as the definition of continuity.
- Students will explain verbally in class the connection between derivatives, rates of change, and slopes of tangent lines.
- Students will explain (both in writing and verbally) mathematical solutions to problems.

Empirical and Quantitative Skills

- Students will evaluate limits numerically and use the information to draw conclusions about the behavior of a function.
- Students will calculate a derivative numerically and explain the result in the context of the problem.
- Students will manipulate empirical data to develop a mathematical model to use in an optimization problem and then apply calculus to find and interpret the optimal solution.
- Students will apply the Fundamental Theorem of Calculus to quantitatively compute the accumulated change of a quantity.
Class Times:

- 131-505: MWF 9:10-10:00am BLOC 166
- 131-506: MWF 10:20-11:10am BLOC 166
- 131-507: MWF 11:30am-12:20pm BLOC 166

ISBN: 0-495-55972-5 (hard cover) or 1-133-44425-3 (loose-leaf)

Note: When you register for this class you paid for an electronic version of the textbook and access to your computer homework. Thus, you are not required to purchase a hard copy of the textbook. For more information go to http://www.math.tamu.edu/courses/eHomework and click on “Student Information Page”.

Calculator Policy: A TI-83, TI-83PLUS, TI-84, TI-84PLUS, or TI-Nspire (Non-CAS) is REQUIRED; these will be the only calculators I will use in class for demonstrations, and you may use any one of these calculators on most of the quizzes and tests. NOTE: It is considered CHEATING to have notes, formulas, or programs in your calculator other than the ones I give you to use. Consequences for cheating will be severe.

Highly Suggested Homework: Your highly suggested homework will prepare you for your daily grades, computer homework, and tests, but will not be turned in for a grade. It is crucial that you work these problems. A list of highly suggested homework problems can be found on my web site as well as at the end of each section of notes.

Computer Homework: There will be a graded computer homework assignment for each section we cover in class. These assignments will be taken on the WebAssign system. For more information and to login please go to http://www.math.tamu.edu/courses/eHomework

Daily Grades: Your overall daily grade will consist of Quizzies and Take-Home Assignments. Quizzies will be given in class. Quizzies may or may not be announced so it is imperative that you keep up with your highly suggested homework. You are allowed to work together on take-home assignments but copying will NOT be tolerated.

Exams: There will be three in-class exams. You must bring your Student ID to each exam. Calculators will be checked during or before each exam. If there are any programs on your calculator which I did not give you, the occurrence will be considered as scholastic dishonesty. The tentative exam schedule is as follows:

| Exam 1 | Wednesday, 15/February/2012 |
| Exam 2 | Friday, 23/March/2012 |
| Exam 3 | Friday, 20/April/2012 |

Final Exam: The final exam will be comprehensive and will consist of multiple choice problems only. The final exam schedule is as follows:

<table>
<thead>
<tr>
<th>Section</th>
<th>Class Time</th>
<th>Final Exam Date and Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>141-505</td>
<td>MWF 9:10-10:00am</td>
<td>Friday, 4/May/2012 10am-noon</td>
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<tr>
<td>141-506</td>
<td>MWF 10:20-11:10am</td>
<td>Friday, 4/May/2012 3-5pm</td>
</tr>
<tr>
<td>141-507</td>
<td>MWF 11:30am-12:20pm</td>
<td>Monday, 7/May/2012 10:30am-12:30pm</td>
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</table>

Grading: A(90-100%), B(80-89%), C(70-79%), D(60-69%), F(0-59%)

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<table>
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<tr>
<td>3 Exams - 18% each</td>
<td>54%</td>
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<tr>
<td>Computer Homework</td>
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<tr>
<td>Daily Grades</td>
<td>13%</td>
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<tr>
<td>Final Exam</td>
<td>23%</td>
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<tr>
<td>TOTAL</td>
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Grades: Any questions concerning the grading of a Daily Grade or Exam must be presented to me within one week of the return of the assignment. Otherwise the grade will not be changed. I will be posting grades during the semester on E-Learning. Please go to http://elearning.tamu.edu to login.

Make-up Policy: No make-up assignments, quizzes, or exams will be given without an official, written, University Excuse. An absence for a non-acute medical service or regular check-up does not constitute an excused absence. In case of illness, you MUST contact me within TWO working days of the missed assignment/quiz/exam; otherwise, you forfeit the right to a make-up. For more information please see the University Student Rules. Please note that I will NOT accept the Exploratory Statement for Absence from Class form as sufficient written documentation of an excused absence.

Class Policies: To succeed in this class, attendance is a necessity. Be on time to class!! Once in the classroom, you will be expected to be respectful to everyone. This includes turning off and putting away cell phones, ipods, and newspapers. Also, it is very disrespectful to talk during lecture. If I feel you are being disrespectful, I will tell you to leave the classroom.
Available Help: If you are having problems please come to my office hours as soon as possible. Other sources of help include help sessions and week-in-reviews. The days and times will be announced as soon as they are scheduled.

Aggie Honor Code: “An Aggie does not lie, cheat, or steal, or tolerate those who do.” Upon accepting admission to Texas A & M University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning, and to follow the philosophy and rules of the Honor System. Students will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules does not excuse any member of the TAMU community from the requirements or the processes of the Honor System. For additional information please visit: http://aggiehonor.tamu.edu/

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American with Disabilities Act: The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, in Cain Hall, Room B118, or call 845-1637. For additional information visit http://disability.tamu.edu.

Highly Suggested Homework Problems

Exam 1 Material:
Section 1.1 - 1, 5, 7, 9, 13, 19-35(odd), 39, 43, 45, 47, 51, 53, 57-67(odd), 71
Section 1.2 - 1, 3, 7, 11, 13, 15, 19, 21, 23, 25
Section 1.3 - 1, 3, 5, 9, 13, 17, 21, 23, 25, 29, 31, 33, 35, 41, 43, 45, 51, 53, 61
Section 1.5 - 1, 3, 8, 11, 15, 17, 21, 29, 31, 33
Section 1.6 - 1, 3, 9, 13, 17, 23, 25, 27, 29, 33, 35, 37, 41, 49, 51, 55, 61
Section 2.1 - 1, 3, 5, 7, 9
Section 2.2 - 1, 3, 5, 7, 9, 11, 13, 15, 17, 19
Section 2.3 - 1, 9, 11, 13, 15, 19, 21, 23, 33, 37
Section 2.4 - 3, 5, 11, 15, 17, 19, 29, 31, 33, 35
Section 2.5 - 1, 3, 5, 7, 9, 15, 23, 25, 29, 31, 35, 37, 39, 41

Exam 2 Material:
Section 2.6 - 1, 5, 7, 11, 15, 17, 19, 23, 29, 31, 37, 39, 47
Section 2.7 - 1, 3, 5, 7, 9, 21, 25, 27, 35, 37, 41, 43, 45
Section 2.8 - 1, 3, 9, 15, 19, 21, 29
Section 3.1 - 3, 7, 11, 15, 19, 23, 27, 31, 41, 45, 47, 49, 53, 65
Section 3.2 - Do not simplify: 1, 5, 9, 13, 17, 21, 25, 27, 29, 39, 41, 43, 45, 47
Section 3.3 - Do not simplify: 1, 5, 9, 13, 19, 21, 27, 35
Section 3.4 - Do not simplify: 1, 5, 9, 13, 17, 21, 25, 27, 31, 37, 41, 43, 45, 51, 53, 69
Section 3.7 - Do not simplify: 3, 5, 7, 9, 11, 17, 19, 21, 25, 27, 29
Section 3.8 - 1, 3, 5, 7, 9, 13, 15, 23, 25, 33
Section 3.9 - 5, 7, 9, 11, 13, 15, 17, 23, 25, 35

Exam 3 Material:
Section 4.2 - 1, 3, 5, 7, 9, 13, 21, 25, 29, 41, 45, 47, 49, 51
Section 4.3 - 3, 5, 7, 11, 15, 17, 19, 21, 27, 29, 33, 37, 39, 41
Section 4.6 - 3, 5, 7, 11, 13
Section 4.8 - 1, 3, 5, 9, 11, 13, 15, 23, 25, 27, 29, 31, 35, 37, 39, 41, 53
Section 5.1 - 1, 3, 5, 11, 13, 15
Section 5.2 - 1, 3, 5, 9, 31, 33, 37, 41, 43, 49
Section 5.3 - 3, 7, 9, 11, 15, 17, 21, 43, 49, 51, 53, 59, 61
Section 5.4 - 3, 5, 7, 9, 11, 15, 17, 19, 25
Section 5.5 - 1, 3, 5, 7, 9, 13, 15, 17, 19, 21, 23, 25, 29, 31, 41, 45, 47, 51, 53, 55, 63, 67

New Material for Final:
Section 6.1 - 1, 3, 5, 7, 9, 11, 13, 15, 17
Section 6.5 - 1, 3, 5, 7, 15, 17
Section 6.7 - 15, 17

Tentative Schedule:

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<td>XF</td>
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</tbody>
</table>

LEGEND: X:Exam R:Review NC:No Class
Texas A&M University
Core Curriculum Cover Sheet
Initial Request for a course to be considered for the Fall 2014 Core Curriculum

1. This request is submitted by (department name): Mathematics

2. Course prefix and number: Math 141

3. Texas Common Course Number: Click here to enter text.

4. Complete course title: Business Mathematics I

5. Semester credit hours: 3

6. This request is for consideration in the following Foundational Component Area:
   - [ ] Communication
   - [X] Mathematics
   - [ ] Life and Physical Sciences
   - [ ] Language, Philosophy and Culture
   - [ ] Creative Arts
   - [ ] American History
   - [ ] Government/Political Science
   - [ ] Social and Behavioral Sciences

7. This course should also be considered for International and Cultural Diversity (ICD) designation:
   - [ ] Yes
   - [X] No

8. How frequently will the class be offered? Fall, Spring & Summer

9. Number of class sections per semester:
   - Fall average = 22
   - Spring average = 12
   - Summer average = 7

10. Number of students per semester:
    - Fall average = 2331
    - Spring average = 1383
    - Summer average = 305
    - 2011-2012
    - 2010-2011
    - 2009-2010

11. Historic annual enrollment for the last three years:
    - 3997
    - 4017
    - 4043

This completed form must be attached to a course syllabus that sufficiently and specifically details the appropriate core objectives through multiple lectures, outside activities, assignments, etc. Representative from department submitting request should be in attendance when considered by the Core Curriculum Council.

13. Submitted by: [Signature]

   [Course Instructor]

   [Date] 3/27/13

   [Approvals:]

   [Date] 3/29/13

14. Department Head

   [Signature]

   [Date] 4/1/13

15. College Dean/Designee

   [Signature]

   [Date]

For additional information regarding core curriculum, visit the Texas Higher Education Coordinating Board website at www.thecb.state.tx.us/corecurriculum2014

See form instructions for submission/approval process.
Texas A&M University  
Core Curriculum  
Initial Request for a Course Addition to the Fall 2014 Core Curriculum

Foundational Component Area: Mathematics

In the box below, describe how this course meets the Foundational Component Area description for Mathematics. Courses in this category focus on quantitative literacy in logic, patterns, and relationships. Courses involve the understanding of key mathematical concepts, and the application of appropriate quantitative tools to everyday experience.

The proposed course must contain all elements of the Foundational Component Area. How does the proposed course specifically address the Foundational Component Area definition above?

This course is focused on quantitative literacy in mathematics found in both business and everyday life. Upon successful completion of this course, students will be able to:
- Logically find relationships among variables to formulate mathematical models for everyday applications, including business applications, such as cost, revenue, profit, supply, and demand.
- Understand matrices and their applications, including solving systems of linear equations.
- Construct linear programming problems for various applications and solve using graphical techniques, including finding the optimal point(s) where a company minimizes its costs or maximizes its profit.
- Understand set terminology and its relationship to symbolic notation.
- Use Venn diagrams to model the relationship between sets and set operations, with applications to real-world problems.
- Understand the principles of probability and counting and apply these concepts to a variety of problems, such as finding the number of ways or probability of obtaining particular card hands.
- Identify types of random variables and calculate probabilities and statistics for random variables.
- Apply the concepts of finance to real-world situations, such as financing a car or house.

Core Objectives

Describe how the proposed course develops the required core objectives below by indicating how each learning objective will be addressed, what specific strategies will be used for each objective and how student learning of each objective will be evaluated.

The proposed course is required to contain each element of the Core Objective.

Critical Thinking (to include creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information):

The following critical thinking skills will be assessed on in-class quizzes and exams.
- Students will carefully examine and interpret statements to determine equivalent mathematical notation and/or equations.
- Students will think creatively in order to set up a system of equations and solve a word problem.
- Students will analyze given information to set up a linear programming problem, including a system of linear inequalities.
- Students will use inquiry to determine if a solution exists to a linear programming problem.
- Students will examine given information about sets to find the number of elements in particular subsets.
- Students will innovatively use counting techniques (multiplication principle, combinations, permutations) to determine the number of ways a task can be completed and to find the probability the task occurs.
- Students will synthesize information to determine whether or not events are independent.
- Students will differentiate between basic and conditional probability, including knowing when Bayes’ Theorem is appropriate.
Texas A&M University

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- Students will evaluate probabilities involving Venn diagrams, tree diagrams, and independent events.
- Students will classify random variables as finite discrete, infinite discrete, or continuous and find all possible values they may assume.
- Students will understand the difference between odds and the probability of an event, and be able to determine one given the other.
- Students will use inquiry to resolve whether or not an experiment is binomial.
- Students will calculate probabilities of binomial and normal random variables.
- Students will understand the difference between simple and compound interest and when to use each.

Communication (to include effective development, interpretation and expression of ideas through written, oral and visual communication):

The following communication skills will be assessed on in-class quizzes and exams, and in lecture.

- Students will express mathematical concepts both abstractly with equations and in writing.
- Students will exhibit functions, as well as solutions to linear inequalities, graphically.
- Students will explain why a matrix operation is possible or not, and interpret the meaning of the entries of the resulting matrix when the operation makes sense.
- Students will solve linear programming problems graphically.
- Students will effectively communicate information about sets and experiments using written symbolic notation.
- Students will visually represent sets with Venn diagrams.
- Students will visually display experiments and associated probabilities using tree diagrams.
- Students will communicate statistics through probability distributions and graphically through histograms.
- Students will answer questions during lecture concerning topics discussed in class.

Empirical and Quantitative Skills (to include the manipulation and analysis of numerical data or observable facts resulting in informed conclusions):

The following empirical and quantitative skills will be assessed on in-class quizzes and exams.

- Students will develop business-related mathematical models from given data, such as cost, revenue, profit, supply, demand, or depreciation.
- Students will create empirical probability distributions based on a given set of data.
- Students will describe numerical data by finding relevant statistics, including expected value, median, mode, standard deviation, and variance.
- Students will use statistics to make informed conclusions about real-world problems, such as determining the the premium for an insurance policy.
- Students will use effective interest rates to select the best loan or savings option.
- Students will analyze financial information to make decisions regarding everyday applications, such as loan payments, annuities, amortizations, or sinking funds.

Please be aware that instructors should be prepared to submit samples/examples of student work as part of the future course recertification process.
**Math 141 – Business Mathematics I**

**Texas A&M University**

**Catalog Description:** Math 141: Business Mathematics I (Credit 3) Linear and quadratic equations and applications; functions and graphs, systems of linear equations, matrix algebra and applications, linear programming, probability and applications, statistics.

**Prerequisites:** High school algebra I and II and geometry. Credit will not be given for more than one of MATH 141 and 166.

**Learning Outcomes**

This course is focused on quantitative literacy in mathematics found in both business and everyday life. Upon successful completion of this course, students will be able to:

- Logically find relationships among variables to formulate mathematical models for everyday applications, including business applications, such as cost, revenue, profit, supply and demand.
- Understand matrices and their applications, including solving systems of linear equations.
- Construct linear programming problems for various applications and solve using graphical techniques, including finding the optimal point(s) where a company minimizes its cost or maximizes its profit.
- Understand set terminology and its relationship to symbolic notation.
- Use Venn diagrams to model the relationship between sets and set operations, with applications to real-world problems.
- Understand the principles of probability and counting and apply these concepts to a variety of problems, such as finding the number of ways or probability of obtaining particular card hands.
- Identify types of random variables and calculate probabilities and statistics for random variables.
- Apply the concepts of finance to real-world situations, such as financing a car or house.

**Core Objectives**

**Critical Thinking**

- Students will carefully examine and interpret statements to determine equivalent mathematical notation and/or equations.
- Students will think creatively in order to set up a system of equations and solve a word problem.
- Students will analyze given information to set up a linear programming problem, including a system of linear inequalities.
- Students will use inquiry to determine if a solution exists to a linear programming problem.
- Students will examine given information about sets to find the number of elements in particular subsets.
- Students will innovatively use counting techniques (multiplication principle, combinations, permutations) to determine the number of ways a task can be completed and to find the probability the task occurs.
- Students will synthesize information to determine whether or not events are independent.
- Students will differentiate between basic and conditional probability, including knowing when Bayes' Theorem is appropriate.
- Students will evaluate probabilities involving Venn diagrams, tree diagrams, and independent events.
- Students will classify random variables as finite discrete, infinite discrete, or continuous and find all possible values they may assume.
- Students will understand the difference between odds and the probability of an event, and be able to determine one given the other.
- Students will use inquiry to resolve whether or not an experiment is binomial.
- Students will calculate probabilities of binomial and normal random variables.
- Students will understand the difference between simple and compound interest and when to use each.

**Communication Skills**

- Students will express mathematical concepts both abstractly with equations and in writing.
- Students will exhibit functions, as well as solutions to linear inequalities, graphically.
- Students will explain why a matrix operation is possible or not, and interpret the meaning of the entries of the resulting matrix when the operation makes sense.
- Students will solve linear programming problems graphically.
- Students will effectively communicate information about sets and experiments using written symbolic notation.
- Students will visually represent sets with Venn diagrams.
- Students will visually display experiments and associated probabilities using tree diagrams.
- Students will communicate statistics through probability distributions and graphically through histograms.
- Students will answer questions during lecture concerning topics discussed in class.

**Empirical and Quantitative Skills**

- Students will develop business-related mathematical models from given data, such as cost, revenue, profit, supply, demand, or depreciation.
- Students will create empirical probability distributions based on a given set of data.
- Students will describe numerical data by finding relevant statistics, including expected value, median, mode, standard deviation, and variance.
- Students will use statistics to make informed conclusions about real-world problems, such as determining the premium for an insurance policy.
- Students will use effective interest rates to select the best loan or savings option.
- Students will analyze financial information to make decisions regarding everyday applications, such as loan payments, annuities, amorizations, or sinking funds.
Instructor: Kathryn Bollinger
E-mail: bollinger141@math.tamu.edu
(Please include your full name and section color in any email you send to me.)
Web Page: http://www.math.tamu.edu/~bollinger
(Check regularly for announcements and important information, as well as for notes, a daily schedule and other helpful links.)

Office: Blocker 630E
Office Hours: TBA
OR by appointment
* All office hours will be held in Bloc 628, unless you are told otherwise.*
Math Dept. Phone: (979) 845-3261

Class Times & Locations: TBA

Required Materials:

- **Textbook:** Finite Mathematics for the Managerial, Life, and Social Sciences, 10th Ed. by Tan
  o You paid for an electronic book version of the text when you paid your fees for this course.
  o Information on how to access your ebook can be found under the "Student Information Page" at http://www.math.tamu.edu/courses/eHomework/. Look under the Math 141 link.
  o If you would like a hard bound or loose-leaf copy of the textbook you may buy one, but it is not required.

- **Calculator:** A TI-83, TI-84 (Regular, Plus or Silver edition) or the TI-Nspire (non-CAS version) calculator is REQUIRED and you must bring your calculator to each class. If you want to use a calculator other than those listed, it may NOT perform symbolic mathematics and you must have my permission to do so. Calculators are allowed on exams but you must clear and reset the memory before each exam. You may not share calculators during exams or quizzes. I will consider any illegal use of calculators on exams or quizzes as academic dishonesty and report it to the Aggie Honor Council. (Refer to the Academic Integrity Statement on pg. 5)

- **Texas A&M Student ID:** You must bring your student ID to each class.

Grading:

**Grade Weights**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Required Averages</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-Class Daily Assignment Average (details on pg. 3)</td>
<td>5%</td>
</tr>
<tr>
<td>Homework Problem Set Average (details on pg. 3)</td>
<td>10%</td>
</tr>
<tr>
<td>Quiz Average (details on pg. 3)</td>
<td>15%</td>
</tr>
<tr>
<td>Three In-Class Exams (details on pg. 1 &amp; 3)</td>
<td>15% each</td>
</tr>
<tr>
<td>Cumulative Final Exam (details on pg. 1 &amp; 3)</td>
<td>25%</td>
</tr>
<tr>
<td><strong>At the end of the semester, you will receive the grade you earned, according to the distribution above.</strong></td>
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</tr>
</tbody>
</table>

Tentative Exam Schedule:

<table>
<thead>
<tr>
<th>Exam</th>
<th>Sections</th>
<th>Week Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>1.3-1.4, Quadratics, 2.1-2.5</td>
<td>Week of September 16th-20th</td>
</tr>
<tr>
<td>II</td>
<td>3.1-3.3, 6.1-6.4, 7.1</td>
<td>Week of October 14th-18th</td>
</tr>
<tr>
<td>III</td>
<td>7.2-7.6, 8.1-8.4</td>
<td>Week of November 11th-13th</td>
</tr>
</tbody>
</table>

FINAL EXAM Schedule: TBA
See http://registrar.tamu.edu/General/FinalSchedule.aspx for the complete final exam schedule.
A tentative day-by-day semester schedule can be found on the course web page with an abbreviated version below.

### Tentative Schedule: All changes will be announced in class.

<table>
<thead>
<tr>
<th>Week</th>
<th>Dates</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>Aug. 26 - 30</td>
<td>Introduction, Sections 1.3, 1.4, Quadratic Functions</td>
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<tr>
<td></td>
<td></td>
<td>Equations of Lines</td>
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<tr>
<td></td>
<td></td>
<td>Linear Models for Business Applications</td>
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<tr>
<td></td>
<td></td>
<td>Intersection of Lines</td>
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<tr>
<td></td>
<td></td>
<td>Quadratic Functions and Applications</td>
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<tr>
<td>Week 2</td>
<td>Sept. 2 - 6</td>
<td>Sections 2.1, 2.2, 2.3</td>
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<tr>
<td></td>
<td></td>
<td>Formulating Systems of Linear Equations</td>
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<tr>
<td></td>
<td></td>
<td>Gauss-Jordan Elimination</td>
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<tr>
<td></td>
<td></td>
<td>Solving Systems of Linear Equations</td>
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<tr>
<td>Week 3</td>
<td>Sept. 9 - 13</td>
<td>Sections 2.3, 2.4, 2.5</td>
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<tr>
<td></td>
<td></td>
<td>Solving Systems of Linear Equations</td>
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<tr>
<td></td>
<td></td>
<td>Arithmetic Operations with Matrices</td>
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<td></td>
<td>Matrix Multiplication</td>
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<tr>
<td>Week 4</td>
<td>Sept. 16 - 20</td>
<td>Review, Exam I (1.3-1.4, Quadratics, 2.1-2.5)</td>
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<tr>
<td></td>
<td></td>
<td>Graphing Systems of Linear Inequalities</td>
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<td></td>
<td></td>
<td>Formulating Linear Programming Problems</td>
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<td></td>
<td></td>
<td>Graphical Solution of Linear Programming Problems (Method of Corners, Leftovers)</td>
</tr>
<tr>
<td>Week 5</td>
<td>Sept. 23 - 27</td>
<td>Sections 3.1, 3.2, 3.3</td>
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<tr>
<td></td>
<td></td>
<td>Sets and Set Operations</td>
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<td></td>
<td></td>
<td>Venn Diagrams</td>
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<td></td>
<td></td>
<td>The Multiplication Principle</td>
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<tr>
<td>Week 6</td>
<td>Sept. 30 - Oct. 4</td>
<td>Sections 6.1, 6.2, 6.3</td>
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<tr>
<td></td>
<td></td>
<td>The Multiplication Principle</td>
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<tr>
<td></td>
<td></td>
<td>Permutations and Combinations</td>
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<td></td>
<td></td>
<td>Experiments, Sample Spaces, &amp; Events</td>
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<tr>
<td>Week 7</td>
<td>Oct. 7 - 11</td>
<td>Sections 6.3, 6.4, 7.1</td>
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<tr>
<td></td>
<td></td>
<td>Basic Probability</td>
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<tr>
<td>Week 8</td>
<td>Oct. 14 - 18</td>
<td>Review, Exam II (3.1-3.3, 6.1-6.4, 7.1)</td>
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<tr>
<td></td>
<td></td>
<td>Rules of Probability</td>
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<td></td>
<td></td>
<td>Use of Counting Techniques in Probability</td>
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<tr>
<td>Week 9</td>
<td>Oct. 21 - 25</td>
<td>Sections 7.2, 7.3, 7.4</td>
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<td>Conditional Probability &amp; Tree Diagrams</td>
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<td>Week 10</td>
<td>Oct. 28 - Nov. 1</td>
<td>Sections 7.5, 7.6</td>
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<td></td>
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<td>Independent Events</td>
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<tr>
<td></td>
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<td>Bayes' Theorem</td>
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<tr>
<td>Week 11</td>
<td>Nov. 4 - 8</td>
<td>Sections 8.1, 8.2, 8.3, 8.4</td>
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<tr>
<td></td>
<td></td>
<td>Classification of Random Variables</td>
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<td></td>
<td>Probability Distributions of Random Variables</td>
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<tr>
<td></td>
<td></td>
<td>Expected Value, Statistics, &amp; Odds</td>
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<td></td>
<td></td>
<td>Variance and Standard Deviation</td>
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<td></td>
<td>The Binomial Distribution</td>
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<tr>
<td>Week 12</td>
<td>Nov. 11 - 15</td>
<td>Sections 8.4, Review, Exam III (7.2-7.6, 8.1-8.4)</td>
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<tr>
<td></td>
<td></td>
<td>The Binomial Distribution</td>
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<tr>
<td>Week 13</td>
<td>Nov. 18 - 22</td>
<td>Sections 8.5, 8.6, 5.1</td>
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<tr>
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<td></td>
<td>The Normal Distribution</td>
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<td></td>
<td>Applications of the Normal Distribution</td>
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<td></td>
<td>Simple &amp; Compound Interest</td>
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<td></td>
<td></td>
<td>Effective Rates of Interest</td>
</tr>
<tr>
<td>Week 14</td>
<td>Nov. 25 - 29</td>
<td>Sections 5.2, 5.3 Review</td>
</tr>
<tr>
<td></td>
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<td>Annuities</td>
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<td></td>
<td></td>
<td>Amortization and Sinking Funds</td>
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<tr>
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<td></td>
<td>Thanksgiving Holiday</td>
</tr>
<tr>
<td>Week 15</td>
<td>Dec. 2 - 3</td>
<td>Review (Monday is a &quot;Redefined Friday&quot;, Tuesday is a &quot;Redefined Thursday&quot;)</td>
</tr>
<tr>
<td>Finals</td>
<td>Dec. 6 - 11</td>
<td>Final Exam (Cumulative)</td>
</tr>
</tbody>
</table>
In-Class Daily Assignments (ICAs):
At various times throughout the semester, you will be given assignments (that are not homework problems or quizzes) which must be completed before leaving class. In order to complete the ICAs you will need to have loose-leaf notebook paper and something to write with (a pencil or pen with blue or black ink). Always come to class with these materials. Many times the ICAs will be due within the first five minutes of class, so it is imperative that you arrive to class prepared and on time each day. Other times the ICAs may be given at the end of class, so it is also imperative that you do not leave class early. None of the grades on these assignments may be dropped unless you are missing a grade due to a verified University excused absence.

Homework Problem Sets:
Graded
Graded homework sets will be primarily online, but may include an occasional written assignment.

Online Homework Problem Sets
- All online homework problem sets will be based in the online system WebAssign. Everything you will need to know about logging into your account is available at http://www.math.tamu.edu/courses/eHomework/. Please visit this site for help with technical difficulties, announcements, and more information. I suggest you bookmark this page and visit it before you login to WebAssign each time.
- Be sure to start each assignment well in advance of the due date.
- You should use Mozilla Firefox and have the most updated versions of Java and Flash on the computer you are using to alleviate technical problems.
- If you ever have technical issues with WebAssign, please fill out a Student Help Request Form found at http://www.math.tamu.edu/courses/eHomework/.
- I will not give extensions or grade adjustments due to technical difficulties at the last minute.

Written Homework
Each collected written homework assignment must contain your NAME, SECTION COLOR, and SEAT # in the top right hand corner of the front page and all subsequent pages must be STAPLED to the first page. All of your work must be shown and it must be neat and legible, with all answers clearly marked. You should use pencil, but if you choose to use pen, then you should use a pen with blue or black ink. Failure to follow these instructions may result in a grade of zero.

Late Work
Written assignments are due at the beginning of the class period before I have started collecting papers. If you arrive after I have started collecting papers, but before I have finished picking them up, then a 20% late penalty will be imposed. Once I have finished collecting papers, your assignment may not be accepted at all. No extensions on online homework problem sets will be granted without a verified University excused absence.

Non-Graded
Math cannot be learned by watching someone else do math; it requires working lots of practice problems. In addition to graded homework, I STRONGLY recommend that you keep a notebook in which you work the problems from the suggested homework list for the textbook, found on our course webpage after a topic is covered in class, but before trying the graded homework. There are also “Practice” problem sets in WebAssign which are not for a grade, but each will be of help when trying to complete the corresponding graded “Homework” problem set.

It is imperative that you work many different problems in order to help you be fully prepared for quizzes and exams.

Quizzes:
You can expect to be given a mixture of in-class, take-home, announced and unannounced quizzes throughout the semester. Quizzes may be given at any time during class, so make sure you arrive on time to each class and do not leave class early. You will be expected to show all of your work, including calculator methods, on all problems for full credit, unless it is stated otherwise.

Exams:
There will be three in-class exams. You will be expected to show all of your work, including calculator methods, on all problems for full credit, unless it is stated otherwise.

Final Exam:
The in-class final exam is COMPREHENSIVE. The presence of material on the final is roughly proportionate to the amount of time we spend on that material during the semester.
Additional Help & Preparing for Exams:

- **Me:** I am here to help you but I can’t help if I don’t know there is a problem. I encourage each of you to talk to me, ask questions both in and out of class, come to office hours, send emails, etc. Your best bet for success is active participation!

- **Class Notes:** An outline of notes will be posted before class each day. It will be beneficial to print these out and bring them with you to class. You should review your notes after class, and make sure to get any questions you have about the material in the notes answered, before the next class meeting, if possible. A completed set of notes will NOT be posted after class (with the exception of the Prerequisite Information material). You should also review your notes when working on homework or when preparing for exams.

- **TAs:** Each of my classes will have a teaching assistant. These teaching assistants will be offering additional help at times outside of my office hours and other provided help hours. Times and places for these additional hours of help will be posted on our course webpage and will be announced in class, once they are determined.

- **Your Classmates:** Get to know your classmates. Form study groups and work on suggested problems outside of class.

- **Week-in-Review (WIR):** There are Week-in-Review sessions conducted by instructors each week. Each review is open to all Math 141 students to review the topics of the previous week and to provide additional examples. The days, times and places of these reviews will be posted on our course webpage and will be announced in class, once they are determined. Additionally, this information can be found at [http://www.math.tamu.edu/courses/weekinreview.html](http://www.math.tamu.edu/courses/weekinreview.html).

Additional sets of old Week-in-Review questions with solutions are linked from our course webpage.

- **Practice:** In order to succeed in this course, it is essential that YOU practice extra problems ON YOUR OWN. See the suggested homework list for the textbook and additional problem sets linked from our course webpage. Even if you are not able to attend either WIR, you can still use the provided problems for practice. If you regularly attend a particular WIR, it might be a good idea to work through the problems from the other WIR, on your own, for additional practice.

- **Help Sessions:** Help sessions are an opportunity for you to ask questions and get help with your homework. These sessions are led by students, where you may come and go, as your schedule allows. Once determined, the schedule will be announced in class, posted on our course webpage and additionally posted at [http://www.math.tamu.edu/courses/helpsessions.html](http://www.math.tamu.edu/courses/helpsessions.html).

- **Video Resources:** In WebAssign, under the Announcements section, there is a link to resource videos for the topics covered in this class.

- **Calculator Help:** Step-by-step written keystroke directions are available for all the calculator functions in the course on our course webpage.

Policies:

You are responsible for checking your TAMU e-mail account and the announcements on our course webpage DAILY.

**Attendance**

Attendance is essential in this class. By attendance, I mean arriving to class on time, ready to actively participate throughout the entire class time, and not leaving early. Attendance will be used in conjunction with your final exam grade as a consideration in the case of borderline grades.

**Grade Disputes**

If you disagree with any deduction taken on an assignment or exam handed back in class, you must bring it to my attention within two working days of it being returned to be re-graded. Due to privacy issues, I cannot discuss grades over email or phone. If you have a question about your grade, please come see me in person.

**Late Work**

All assignments due in class are due at the beginning of the class period before I have started collecting papers. If you arrive after I have started collecting papers, but before I have finished picking them up, then a 20% late penalty will be imposed. Once I have finished collecting papers, your assignment may not be accepted at all. No extensions on online homework problem sets will be granted without a verified University excused absence.

**Copyright**

All exams, printed handouts and/or assignments, and web-materials are protected by U.S. Copyright Laws. No multiple copies can be made without my written permission. No exams or assignments may be shared with anyone outside of the class or posted on any website.
Scholastic Dishonesty

- An Aggie does not lie, cheat, or steal, or tolerate those who do!
  (You are an Aggie, and so am I! The Aggie Code of Honor will be enforced.)
- Students are encouraged to study together, unless otherwise directed, but all work intended for a grade must clearly be your work as an individual. All exams and quizzes (whether in class, online, or take-home) are to be taken individually.
- Upon accepting admission to Texas A&M University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning, and to follow the philosophy and rules of the Honor System. Students will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules does not excuse any member of the TAMU community from the requirements or the processes of the Honor System. For additional information on the Honor Council Rules and Procedures, consult http://www.tamu.edu/aggiehonor/.
- Note: It is considered CHEATING to have notes, formulas, or programs in your calculator. It is also considered Academically Dishonesty to provide falsified documentation in order to obtain an excused absence.

Make-up Policy

No make-ups will be given without written evidence of an official University excused absence. (See University Student Rules.) According to Section 7.3 of the University Student Rules, for an absence to be considered excused, “the student must notify his or her instructor in writing (acknowledged e-mail message is acceptable) prior to the date of absence if such notification is feasible. In cases where advance notification is not feasible (e.g. accident or emergency) the student must provide notification by the end of the second working day after the absence. This notification should include an explanation of why notice could not be sent prior to the class.” In addition (and also in accordance with University Student Rules), a written excuse must be presented upon return to class. Specifically, in the case of illness too severe or contagious to attend class or in the case of injury, students are required to obtain a confirmation note from a health care professional affirming date and time of a medical office visit regarding the illness or injury and confirming the need of the absence (with permission to verify) before a make-up will be given. The Texas A&M University Explanatory Statement for Absence will NOT be accepted. An absence for a non-acute medical service does not constitute an excused absence. Students with an official University excused absence are permitted to make up work only for the dates of the absence.

It is the student’s responsibility to contact me within the proper time period, in order to schedule make-up assignments.

If class is officially cancelled for any reason, you can expect that the assignments due/taken on the missed class day will be due/taken the next time the class meets.

Disability Services

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, in Cain Hall, Room B118 or call 845-1637.

For additional information visit http://disability.tamu.edu.

Classroom Etiquette Policies

Electronic Device Policy: Unless given permission otherwise by me, all electronic devices must be

**TURND OFF AND PUT AWAY WHILE YOU ARE IN THE CLASSROOM!**

This means the following...

- You should never have a cell phone out or turned on in the classroom — before, during, or after class (unless you specifically have been given permission from me before class). If I hear or see your cell phone out in the classroom, I may ask you to leave class. If you are asked to leave the classroom, you will not be allowed to complete any assignments taken for a grade during the remainder of that class.

- If I see your cell phone out in the classroom (whether turned on or not) WHILE a grade is being taken (ICA, quiz, or exam), you will receive a ZERO on the assignment and you will be asked to leave the classroom.

- Calculators are allowed to be on during class while being used for math. You should always have your calculator out and ready to use by the time class starts. On exam days, you are not allowed to have your calculator lid out and your calculator memory must be RESET before entering the classroom.

- You are not allowed to have any other electronic device (computer, ipod, etc.) out or turned on while in the classroom (unless you specifically have been given permission from me before class).

Courtesy & Respect: During class I will stay focused on teaching you mathematics, so please stay focused on learning the mathematics being taught. This means you should arrive to class on time, you should stay awake throughout class, you should not be reading a newspaper or working with materials from another course, you should refrain from discussion not related to class, and you should not leave class early (unless there is an emergency or you have talked to me before class). If I feel you are being disruptive or disrespectful during class, you may be asked to leave the room.
Texas A&M University
Core Curriculum Cover Sheet
Initial Request for a course to be considered for the Fall 2014 Core Curriculum

1. This request is submitted by (department name): Mathematics

2. Course prefix and number: MATH 142

3. Texas Common Course Number: MATH 1325

4. Complete course title: Business Mathematics II

5. Semester credit hours: 3

6. This request is for consideration in the following Foundational Component Area:
   □ Communication
   X Mathematics
   □ Life and Physical Sciences
   □ Language, Philosophy and Culture
   □ Creative Arts
   □ American History
   □ Government/Political Science
   □ Social and Behavioral Sciences

   Current core - Yes

7. This course should also be considered for International and Cultural Diversity (ICD) designation:
   □ Yes  X No

8. How frequently will the class be offered? every fall, spring and summer semesters

9. Number of class sections per semester:
   Fall=3 regular+1 honors; Spring=4 regular+1 honors;
   Summer= 6 regular

10. Number of students per semester: Average per semester: Fall= 835; Spring=1025; Summer= 210

11. Historic annual enrollment for the last three years: 2180 2125 1890

This completed form must be attached to a course syllabus that sufficiently and specifically details the appropriate core objectives through multiple lectures, outside activities, assignments, etc. Representative from department

submitting request should be in attendance when considered by the Core Curriculum Council.

12. Submitted by:
   Angela Allen
   Course Instructor
   Date 3/21/13

   Approvals:
   Date 3/29/13

14. Department Head
   Date 4/1/13

15. College Dean/Designee

See form instructions for submission/approval process.

Associate Provost for Undergraduate Studies

APR-01
Texas A&M University
Texas A&M University
Core Curriculum
Initial Request for a Course Addition to the Fall 2014 Core Curriculum

Foundational Component Area: Mathematics

In the box below, describe how this course meets the Foundational Component Area description for Mathematics. Courses in this category focus on quantitative literacy in logic, patterns, and relationships. Courses involve the understanding of key mathematical concepts, and the application of appropriate quantitative tools to everyday experience.

The proposed course must contain all elements of the Foundational Component Area. How does the proposed course specifically address the Foundational Component Area definition above?

This course is focused on quantitative literacy in mathematics found in both business and everyday life. Upon successful completion of this course, students will be able to:

- Logically formulate mathematical variables and equations to quantitatively create mathematical models representing problems in everyday life, as well as business, so that calculus can be applied to achieve an optimal solution.
- Quantitatively analyze business concepts such as market equilibrium and break-even analysis.
- Demonstrate knowledge of basic functions, including exponentials and logarithms, to solve financial investment problems.
- Identify patterns in numeric data to calculate limits and derivatives of functions numerically.
- Justify whether a function is continuous or not using the mathematical definition of continuity.
- Understand the derivative as a rate of change in order to quantitatively apply it to everyday life as well as business applications such as marginal analysis and elasticity of demand.
- Investigate the relationship between a function and its first and second derivatives, and use the information obtained from its derivatives to identify pertinent information about the function.
- Apply the definite integral to quantitatively determine solutions to problems in everyday life and business such as area between curves, average value of a function, and producers' and consumers' surplus.
- Recognize and appreciate the relationship between the derivative (rate of change) and the definite integral (accumulation of change), and utilize the Fundamental Theorem of Calculus as the bridge between the two.
- Generalize and extend the pattern of various calculus techniques to functions of two variables in order to find solutions to both everyday and business problems such as marginal productivity of labor and capital.

Core Objectives

Describe how the proposed course develops the required core objectives below by indicating how each learning objective will be addressed, what specific strategies will be used for each objective and how student learning of each objective will be evaluated.

The proposed course is required to contain each element of the Core Objective.

Critical Thinking (to include creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information):

The following critical thinking skills will be assessed on various assignments which may include homework, quizzes, and/or exams:

- Students will analyze a function and justify whether or not it is continuous using the definition of continuity.
- Students will use inquiry to determine the best method for taking derivatives of complicated functions.
Texas A&M University

Core Curriculum

Initial Request for a Course Addition to the Fall 2014 Core Curriculum

- Students will identify and categorize information about a function in order to construct a graph of its derivative.
- Students will apply calculus to find innovative ways to graph complicated functions without the aid of technology.
- Students will analyze and synthesize data and think creatively to develop mathematical models for optimization purposes.
- Students will examine how the Fundamental Theorem of Calculus connects differential and integral calculus.

Communication (to include effective development, interpretation and expression of ideas through written, oral and visual communication):

The following communication skills will be assessed on various assignments which may include homework, quizzes, and/or exams, as well as during lecture:

- Students will symbolically relay mathematical information and concepts by creating variables and writing equations.
- Students will recognize, construct, and interpret graphs of basic functions.
- Students will write mathematical information symbolically to describe the behavior of functions.
- Students will justify results that use mathematical definitions such as the definition of continuity by writing proofs.
- Students will explain verbally in class the connection between derivatives, rates of change, and slopes of tangent lines.
- Students will develop sketches of the graphs of complicated functions by analyzing their first and second derivatives.
- Students will explain (both in writing and verbally) mathematical solutions to problems.
- Students will be required to answer questions during lecture concerning topics discussed in class.

Empirical and Quantitative Skills (to include the manipulation and analysis of numerical data or observable facts resulting in informed conclusions):

The following empirical and quantitative skills will be assessed on various assignments which may include homework, quizzes, and/or exams:

- Students will evaluate limits numerically and use the information to draw conclusions about the behavior of a function.
- Students will calculate a derivative numerically and explain the result in the context of the problem.
- Students will use marginal analysis to make informed and quantitative business decisions.
- Students will manipulate empirical data to develop a mathematical model to use in an optimization problem, such as maximizing revenue or minimizing cost, and then apply calculus to find and interpret the optimal solution.
- Students will apply the Fundamental Theorem of Calculus to quantitatively compute the accumulated change of a quantity.

Please be aware that instructors should be prepared to submit samples/examples of student work as part of the future course recertification process.
CATALOG DESCRIPTION: Math 142: Business Mathematics II (Credit 3) Derivatives, curve sketching and optimization, techniques of derivatives, logarithms and exponential functions with applications, integrals, techniques and applications of integrals, multivariate calculus. Prerequisites: High school algebra I and II and geometry or satisfactory performance on a qualifying examination. Credit will not be given for more than one of MATH 131, MATH 142, MATH 147, MATH 151 and MATH 171.

LEARNING OUTCOMES: This course is focused on quantitative literacy in mathematics found in both business and everyday life. Upon successful completion of this course, students will be able to:

- Logically formulate mathematical variables and equations to quantitatively create mathematical models representing problems in everyday life, as well as business, so that calculus can be applied to achieve an optimal solution.
- Quantitatively analyze business concepts such as market equilibrium and break-even analysis.
- Demonstrate knowledge of basic functions, including exponentials and logarithms, to solve financial investment problems.
- Identify patterns in numeric data to calculate limits and derivatives of functions numerically.
- Justify whether a function is continuous or not using the mathematical definition of continuity.
- Understand the derivative as a rate of change in order to quantitatively apply it to everyday life as well as business applications such as marginal analysis and elasticity of demand.
- Investigate the relationship between a function and its first and second derivatives, and use the information obtained from its derivatives to identify pertinent information about the function.
- Apply the definite integral to quantitatively determine solutions to problems in everyday life and business such as area between curves, average value of a function, and producers’ and consumers’ surplus.
- Recognize and appreciate the relationship between the derivative (rate of change) and the definite integral (accumulation of change), and utilize the Fundamental Theorem of Calculus as the bridge between the two.
- Generalize and extend the pattern of various calculus techniques to functions of two variables in order to find solutions to both everyday and business problems such as marginal productivity of labor and capital.

CORE OBJECTIVES:

Critical Thinking
- Students will analyze a function and justify whether or not it is continuous using the definition of continuity.
- Students will use inquiry to determine the best method for taking derivatives of complicated functions.
- Students will identify and categorize information about a function in order to construct a graph of its derivative.
- Students will apply calculus to find innovative ways to graph complicated functions without the aid of technology.
- Students will analyze and synthesize data and think creatively to develop mathematical models for optimization purposes.
- Students will examine how the Fundamental Theorem of Calculus connects differential and integral calculus.

Communication Skills
- Students will symbolically relay mathematical information and concepts by creating variables and writing equations.
- Students will recognize, construct, and interpret graphs of basic functions.
- Students will write mathematical information symbolically to describe the behavior of functions.
- Students will justify results that use mathematical definitions such as the definition of continuity by writing proofs.
- Students will explain verbally in class the connection between derivatives, rates of change, and slopes of tangent lines.
- Students will develop sketches of the graphs of complicated functions by analyzing their first and second derivatives.
- Students will explain (both in writing and verbally) mathematical solutions to problems.
- Students will be required to answer questions during lecture concerning topics discussed in class.

Empirical and Quantitative Skills
- Students will evaluate limits numerically and use the information to draw conclusions about the behavior of a function.
- Students will calculate a derivative numerically and explain the result in the context of the problem.
- Students will use marginal analysis to make informed and quantitative business decisions.
- Students will manipulate empirical data to develop a mathematical model to use in an optimization problem, such as maximizing revenue or minimizing cost, and then apply calculus to find and interpret the optimal solution.
- Students will apply the Fundamental Theorem of Calculus to quantitatively compute the accumulated change of a quantity.
INSTRUCTOR: Angela J. Allen  
WEB PAGE: http://www.math.tamu.edu/~aallen  
E-MAIL: angieallen@neo.tamu.edu  
OFFICE: Blocker 641A  
MATH DEPT. PHONE: 979-45-3261  
OFFICE HOURS: TBA and by appointment

CLASS TIME/LOCATION: TBA

REQUIRED TEXT: Calculus: Applications and Technology, 3rd edition, by Tomastik

Note: When you registered for this class, you paid for an electronic version of the textbook and access to your online homework (you will access both through WebAssign). For more information, go to http://www.math.tamu.edu/courses/eHomework and click on "Student Information page".

REQUIRED CLICKER: This section of Math 142 requires that you have an iclicker or iclicker2 (you will not be allowed to use webclicker). You can purchase a clicker from local bookstores or online at http://www.iclicker.com.

COURSE WEB PAGE: My course web page will be a source of communication to you aside from class and office hours. There, you will find a course calendar, a link to the departmental web page for the course, as well as links to the Math 142 Help Session and Week in Review schedules. Check the course web page regularly for announcements, exam information, and an updated schedule.

EMAIL POLICY: Check your official TAMU email account EVERY day. You are responsible for any information I send via email. Also, because of privacy rights, I cannot discuss grades via email. You must include your full name, course number (142), and section number in any email.

CALCULATOR POLICY: A TI-83, TI-84 (Regular, Plus or Silver edition) or the TI-Nspire (non-CAS version) calculator is REQUIRED, and you must bring your calculator to each class. If you want to use a calculator other than those listed, it may NOT perform symbolic mathematics and you must have my permission to do so. Furthermore, the only programs that are allowed on your calculator are those I provide you with (if any) during class. All other programs must be erased from the calculator. You can save these to your computer and add them back to the calculator after your final exam if you wish.

GRADING POLICY:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exam I</td>
<td>20%</td>
</tr>
<tr>
<td>Exam II</td>
<td>20%</td>
</tr>
<tr>
<td>Exam III</td>
<td>20%</td>
</tr>
<tr>
<td>Graded Homework</td>
<td>10%</td>
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<tr>
<td>Grade Average</td>
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<tr>
<td>Quiz Average</td>
<td>10%</td>
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<tr>
<td>Grade Average</td>
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<tr>
<td>Comprehensive Final</td>
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<tr>
<td>Exam</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
</tr>
</tbody>
</table>

***At the end of this semester, you will receive the grade you earned in the course according to the distribution above (no exceptions).

MAKE-UP POLICY: No make-ups will be given without written evidence of an official University excused absence (see University Student Rules). In addition, you must notify me NO LATER than the end of the second working day after the missed assignment:

... the student must notify his or her instructor in writing (acknowledged e-mail message is acceptable) prior to the date of absence if such notification is feasible. In cases where advance notification is not feasible (e.g., accident or emergency) the student must provide notification by the end of the second working day after the absence. This notification should include an explanation of why notice could not be sent prior to the class. (Section 7.3 of the University Student Rules)

***If no such notice is given, the rights to a make-up are forfeited. Specifically, in the case of injury or illness, students are required to obtain a confirmation note from a health care professional affirming date and time of a medical office visit regarding the injury or illness. I will NOT accept the "Explanatory Statement for Absence from Class" form as sufficient written documentation of an excused absence.
LATE WORK POLICY: Late work (for which you do not have a University approved excused absence) will NOT be accepted.

EXAMS: There will be three in class exams and a comprehensive final exam. You must bring a picture id (student id or driver’s license) to the exams.

NO make-up exams will be given without a University approved excused absence (with written proof). If you have an excused absence for an exam day, you must contact me NO LATER than the second working day after the missed exam day to schedule a make-up exam (see University Student Rules).

Tentative Exam Schedule:
Exam I: TBA 
Exam II: TBA
Exam III: TBA

Final Exam: TBA

GRADED HOMEWORK: Homework will primarily be online. Other assignments that are part of your homework grade may include videos, written assignments, PDF form assignments or in-class activities.

SUGGESTED HOMEWORK: A list of suggested homework problems is posted on the course webpage. These problems are from your textbook and will not be collected for a grade, but it is IMPERATIVE that you do the problems on the suggested homework list to prepare for exams. If you need help with any of these suggested homework problems, please attend my office hours, your T.A.’s office hours, or a Math 142 Help Session.

QUIZZES: Quizzes may include, but are not limited to, individual in-class quizzes as well as group in-class quizzes. These may also be in the form of clicker quizzes, so it is very important that you have your clicker each class day. Some quizzes will be announced, while others may not be announced ahead of time. Other questions may be asked during lecture that must be answered if you are called on.

ATTENDANCE: I STRONGLY suggest that you attend every lecture. Falling behind in this course can be very detrimental to your grade. If you miss lecture, you must have an official University excused absence (with written proof) in order to hand-copy your T.A.’s notes (during office hours).

HELP SESSIONS: The times and locations for Math 142 Help Sessions will be announced by the second week of classes and can be found on the course webpage. The help sessions have drop-in hours where you can get help with your suggested homework, online homework, class notes, or other problems. These help sessions are an excellent source of help, especially if you are unable to attend my office hours or your T.A.’s office hours.

WEEK IN REVIEW: The Math 142 Week in Review is held by a lecturer in the math department. Each Week in Review will cover the material taught in class the previous week. The direct link to the Week in Review can be found on our course web page. There, you will find the times, locations, and practice problems for each review. You should print the practice problems and bring them with you to the Week in Review.

SCHOLASTIC DISHONESTY: Copying work done by others, either in-class or out-of-class, is an act of scholastic dishonesty and will be prosecuted to the full extent allowed by University policy. Collaboration on assignments, either in-class or out-of-class, is forbidden unless I grant permission. If you cheat on an assignment, you will receive a zero. Also, you will be reported to the University. Another form of cheating is typing formulas in the calculator or using programs that give you an advantage over classmates. If I catch anyone cheating this way, you will get a zero on the assignment and be reported to the University "or cheating.

Remember the Aggie Code of Honor: “An Aggie does not lie, cheat, or steal or tolerate those who do.”

For more information about the Honor Council Rules and Procedures visit the website: http://www.tamu.edu/aggiehonor

SCHOLASTIC DISHONESTY WILL NOT BE TOLERATED!

COPYRIGHT POLICY: All printed materials disseminated in class or on the web are protected by Copyright laws. One copy (or download from the web) is allowed for personal use. Multiple copies or sale of any of these materials is strictly prohibited.

STATEMENT ON DISABILITIES ACT: The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, in Cain Hall, Room B118, or call 979-845-1637. For additional information visit http://disability.tamu.edu.
ELECTRONIC DEVICE POLICY:

- Cell phones must be turned off and out of sight during class. If I hear or see your cell phone, I may ask you to leave class (this is in accordance with University Student Rules).

- Calculators are allowed to be on during class while being used for math. You should always have your calculator out and ready to use by the time class starts. On exam days, you are not allowed to have your calculator lid out, and your calculator memory must be RESET before entering the room.

- You are NOT allowed to have any other electronic device (computer, ipod, ipad, etc.) out or turned on during class.

TENTATIVE WEEKLY SCHEDULE: (Any changes will be reflected on the calendar on our course web page.)

<table>
<thead>
<tr>
<th>Week #</th>
<th>Lecture Material (Sections)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A.8, 1.0, 1.1 topics, 1.2 topics, 1.3</td>
<td>Basic Functions and Shifts, Complete Graphs, Overview of Increasing/Decreasing, Concavity, and Continuity, Piecewise-Defined Functions, Break-Even Analysis and Market Equilibrium, Exponential Functions</td>
</tr>
<tr>
<td>2</td>
<td>1.5, 3.1</td>
<td>Logarithmic Functions, Limits and Continuity</td>
</tr>
<tr>
<td>3</td>
<td>3.2, 3.3</td>
<td>Rates of Change, The Derivative</td>
</tr>
<tr>
<td>4</td>
<td>Review, Exam 1</td>
<td>Review Exam 1, Exam 1 covering A.8, 1.0, 1.1 topics, 1.2 topics, 1.3, 1.5, and 3.1-3.3</td>
</tr>
<tr>
<td>5</td>
<td>4.1, 4.2, 4.3</td>
<td>Simple Derivative Rules and Marginal Analysis, Product and Quotient Rules, Chain Rule</td>
</tr>
<tr>
<td>6</td>
<td>4.4, 4.5, 5.1</td>
<td>Derivatives of Exponential and Logarithmic Functions, Elasticity of Demand, Analyzing Graphs with the First Derivative</td>
</tr>
<tr>
<td>7</td>
<td>3.2, 3.3</td>
<td>Analyzing Graphs with the Second Derivative, Limits at Infinity, Curve Sketching Techniques</td>
</tr>
<tr>
<td>8</td>
<td>5.5, 5.6</td>
<td>Absolute Extrema, Optimization</td>
</tr>
<tr>
<td>9</td>
<td>Review, Exam 2</td>
<td>Review Exam 2, Exam 2 covering 4.1-4.5 and 5.1-5.6</td>
</tr>
<tr>
<td>10</td>
<td>6.1, 6.2, 6.3</td>
<td>Antiderivatives, Substitution, Riemann Sums and Estimating Distance</td>
</tr>
<tr>
<td>11</td>
<td>6.4, 6.5, 6.6</td>
<td>The Definite Integral, Fundamental Theorem of Calculus and Average Value of a Function, Area Between Curves</td>
</tr>
<tr>
<td>12</td>
<td>6.7 topic, 8.1, 8.2</td>
<td>Producers' and Consumers' Surplus, Functions of Several Variables, Partial Derivatives</td>
</tr>
<tr>
<td>13</td>
<td>Review</td>
<td>Review Exam 3</td>
</tr>
<tr>
<td>14</td>
<td>Exam 3, 8.3</td>
<td>Exam 3 covering 6.1-6.6, 6.7 topic, and 8.1-8.2; Extrema</td>
</tr>
<tr>
<td>15</td>
<td>Review for Final Exam</td>
<td>Review for Final Exam</td>
</tr>
<tr>
<td>16</td>
<td>FINAL EXAM</td>
<td>Comprehensive Final Exam covering all previous sections as well as 8.3</td>
</tr>
</tbody>
</table>
Texas A&M University

Core Curriculum Cover Sheet
Initial Request for a course to be considered for the Fall 2014 Core Curriculum

1. This request is submitted by (department name): Mathematics

2. Course prefix and number: Math 147

3. Texas Common Course Number: Click here to enter text.

4. Complete course title: Calculus I for Biological Sciences

5. Semester credit hours: 4

6. This request is for consideration in the following Foundational Component Area:

☐ Communication
☐ Creative Arts

☐ Mathematics
☐ American History

☐ Life and Physical Sciences
☐ Government/Political Science

☐ Language, Philosophy and Culture
☐ Social and Behavioral Sciences

7. This course should also be considered for International and Cultural Diversity (ICD) designation:

☐ Yes
☒ No

8. How frequently will the class be offered? Fall, Spring, Summer


11. Historic annual enrollment for the last three years: 2011-2012 2010-2011 2009-2010

☐ 288 246 251

This completed form must be attached to a course syllabus that sufficiently and specifically details the appropriate core objectives through multiple lectures, outside activities, assignments, etc. Representative from department submitting request should be in attendance when considered by the Core Curriculum Council.

12. Submitted by:

☒ Lauren Ramsey

Course Instructor

Approvers:

Date: March 27, 2013

13. Date: 03/29/13

14. Department Head

Date: 4/1/13

15. College Dean/Designee

Date

For additional information regarding core curriculum, visit the Texas Higher Education Coordinating Board website at www.thecb.state.tx.us/corecurriculum2014

See form instructions for submission/approval process.
Texas A&M University

Core Curriculum

Initial Request for a Course Addition to the Fall 2014 Core Curriculum

Foundational Component Area: Mathematics

In the box below, describe how this course meets the Foundational Component Area description for Mathematics. Courses in this category focus on quantitative literacy in logic, patterns, and relationships. Courses involve the understanding of key mathematical concepts, and the application of appropriate quantitative tools to everyday experience.

The proposed course must contain all elements of the Foundational Component Area. How does the proposed course specifically address the Foundational Component Area definition above?

This course is focused on quantitative literacy in mathematics with an emphasis on real world applications, especially to the biological sciences. Upon successful completion of this course, students will be able to:

- Recognize and construct graphs of basic functions, including polynomials, exponentials, logarithms, and trigonometric functions.
- Construct and interpret semilog and double-log plots used to model biological data.
- Evaluate limits of functions graphically and algebraically.
- Evaluate limits of functions analytically by applying the Sandwich Theorem or L'Hopital's Rule.
- Understand continuity and be able to justify whether a function is continuous or not using the mathematical definition of continuity.
- Explain the Intermediate Value Theorem and use it to estimate roots of functions.
- Compute derivatives using the limit definition of the derivative.
- Interpret derivatives as rates of change and as the slope of a tangent line.
- Compute derivatives of polynomials and rational, trigonometric, exponential, logarithmic, and inverse functions.
- Apply the product rule, quotient rule, and chain rule to take derivatives of compositions of functions
- Set up and solve related rates problems.
- Compute the linear approximation of a function and use it in applications of approximation and error estimation.
- Analyze first and second derivatives to determine intervals where a function is increasing or decreasing, concave up or concave down, and to find the locations of local extrema and inflection points.
- Graph complicated functions by analyzing and evaluating the information obtained by differentiation.
- Set up and solve optimization problems.
- Evaluate limits of sequences and recursions.
- Model single-species populations and analyze population models.
- Find fixed points and analyze their stability using the cobwebbing method and the stability criterion.
- Interpret the definite integral as a sum of signed areas.
- Compute definite integrals using Riemann sums.
- Find the antiderivatives of basic functions.
- Compute definite integrals using the Fundamental Theorem of Calculus.
- Apply the substitution method to compute integrals.

Core Objectives

Describe how the proposed course develops the required core objectives below by indicating how each learning objective will be addressed, what specific strategies will be used for each objective and how student learning of each objective will be evaluated.
Texas A&M University
Core Curriculum

Initial Request for a Course Addition to the Fall 2014 Core Curriculum

The proposed course is required to contain each element of the Core Objective.

Critical Thinking (to include creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information):

The following critical thinking skills will be assessed on exams and other assignments:

- Students will evaluate limits of functions graphically and algebraically.
- Students will evaluate limits of functions analytically by applying the Sandwich Theorem or L’Hopital’s Rule.
- Students will justify whether a function is continuous or not using the mathematical definition of continuity.
- Students will compute derivatives using the limit definition of the derivative.
- Students will compute derivatives of polynomials and rational, trigonometric, exponential, logarithmic, and inverse functions.
- Students will use inquiry to determine the best method for taking derivatives of complicated functions.
- Students will apply calculus to find innovative ways to graph complicated functions without the aid of a graphing calculator or computer.
- Students will think creatively about how to accomplish a given optimization objective and apply calculus to achieve this goal.
- Students will compute the linear approximation of a function and use it in applications of approximation and error estimation.
- Students will think creatively about the relationship between two given rates of change and how they affect each other.
- Students will compute limits of sequences and recursions and synthesize the results by explaining the relationship between these limits and the long-term behavior of population growth.
- Students will evaluate and synthesize single-species population data to determine the best mathematical model to represent the population.
- Students will compute definite integrals using Riemann sums.
- Students will find the antiderivatives of basic functions.
- Students will compute definite integrals using the Fundamental Theorem of Calculus.
- Students will apply the substitution method to compute integrals.

Communication (to include effective development, interpretation and expression of ideas through written, oral and visual communication):

The following communication skills will be assessed on exams, during lecture, and on other assignments:

- Students will recognize and construct graphs of basic functions, including polynomials, exponentials, logarithms, and trigonometric functions.
- Students will construct and interpret semilog and double-log plots used to model biological data.
- Students will justify results that require the use of theorems such as the Sandwich Theorem and Intermediate Value Theorem or mathematical definitions such as the definition of continuity by writing mathematical proofs.
- Students will be required to answer questions during lecture concerning topics discussed in class.
- Students will be required to explain verbally in class the connection between derivatives, rates of change, and slopes of tangent lines.
- Students will explain the solutions to related rates problems and optimizations problems in writing.
- Students will develop sketches of the graphs of complicated functions by analyzing the function itself and its first and second derivatives.
- Students will analyze the stability of fixed points by applying the cobwebbing graphical technique.
- Students will interpret definite integrals as sums of signed areas under a graph.
Texas A&M University

Core Curriculum

Initial Request for a Course Addition to the Fall 2014 Core Curriculum

Empirical and Quantitative Skills (to include the manipulation and analysis of numerical data or observable facts resulting in informed conclusions):

The following empirical and quantitative skills will be assessed on exams and other assignments.

- Students will analyze semilog and double-log plots and derive functional relationships associated with such plots.
- Students will analyze population data and determine whether an exponential discrete time model can be used to model the data.
- Students will understand the Intermediate Value Theorem and apply it to locate the roots of functions.
- Students will compute derivatives of functions and use derivatives in applications such as finding equations of tangent lines, computing the linear approximation of a function, solving related rates problems, solving optimization problems, and finding the rate at which a population is growing.
- Students will find the relationship between two given rates of change and make conclusions about how one is affecting the other.
- Students will make conclusions about monotonicity, concavity, extrema, and inflection points of a given function by analyzing the given function and its derivatives.
- Students will manipulate given information to develop a one-variable function to be used in an optimization problem and then apply calculus to find and interpret the optimal solution.
- Students will use antiderivatives and the Fundamental Theorem of Calculus to compute and interpret areas under curves.

Please be aware that instructors should be prepared to submit samples/examples of student work as part of the future course recertification process.
Catalog Title and Description: (CREDIT 4.0) Calculus I for Biological Sciences - Introduction to differential calculus in a context that emphasizes applications in the biological sciences. Prerequisite: MATH 150 or equivalent or acceptable score on TAMU Math Placement Exam. Credit will not be given for more than one of MATH 131, MATH 142, MATH 147, MATH 151 and MATH 171.

Learning Outcomes: This course is focused on quantitative literacy in mathematics with an emphasis on real world applications, especially to the biological sciences. Upon successful completion of this course, students will be able to

- Recognize and construct graphs of basic functions, including polynomials, exponentials, logarithms, and trigonometric functions.
- Construct and interpret semilog and double-log plots used to model biological data.
- Evaluate limits of functions graphically and algebraically.
- Evaluate limits of functions analytically by applying the Sandwich Theorem or L'Hôpital’s Rule.
- Understand continuity and be able to justify whether a function is continuous or not using the mathematical definition of continuity.
- Explain the Intermediate Value Theorem and use it to estimate roots of functions.
- Compute derivatives using the limit definition of the derivative.
- Interpret derivatives as rates of change and as the slope of a tangent line.
- Compute derivatives of polynomials and rational, trigonometric, exponential, logarithmic, and inverse functions.
- Apply the product rule, quotient rule, and chain rule to take derivatives of compositions of functions.
- Set up and solve related rates problems.
- Compute the linear approximation of a function and use it in applications of approximation and error estimation.
- Analyze first and second derivatives to determine intervals where a function is increasing or decreasing, concave up or concave down, and to find the locations of local extrema and inflection points.
- Graph complicated functions by analyzing and evaluating the information obtained by differentiation.
- Set up and solve optimization problems.
- Evaluate limits of sequences and recursions.
- Model single-species populations and analyze population models.
- Find fixed points and analyze their stability using the cobwebbing method and the stability criterion.
- Interpret the definite integral as a sum of signed areas.
- Compute definite integrals using Riemann sums.
- Find the antiderivatives of basic functions.
- Compute definite integrals using the Fundamental Theorem of Calculus.
- Apply the substitution method to compute integrals.

Core Objectives

Critical Thinking

- Students will evaluate limits of functions graphically and algebraically.
- Students will evaluate limits of functions analytically by applying the Sandwich Theorem or L'Hôpital’s Rule.
- Students will justify whether a function is continuous or not using the mathematical definition of continuity.
- Students will compute derivatives using the limit definition of the derivative.
- Students will compute derivatives of polynomials and rational, trigonometric, exponential, logarithmic, and inverse functions.
- Students will use inquiry to determine the best method for taking derivatives of complicated functions.
• Students will apply calculus to find innovative ways to graph complicated functions without the aid of a graphing calculator or computer.
• Students will think creatively about how to accomplish a given optimization objective and apply calculus to achieve this goal.
• Students will compute the linear approximation of a function and use it in applications of approximation and error estimation.
• Students will think creatively about the relationship between two given rates of change and how they affect each other.
• Students will compute limits of sequences and recursions and synthesize the results by explaining the relationship between these limits and the long-term behavior of population growth.
• Students will evaluate and synthesize single-species population data to determine the best mathematical model to represent the population.
• Students will compute definite integrals using Riemann sums.
• Students will find the antiderivatives of basic functions.
• Students will compute definite Integrals using the Fundamental Theorem of Calculus.
• Students will apply the substitution method to compute integrals.

Communication Skills
• Students will recognize and construct graphs of basic functions, including polynomials, exponentials, logarithms, and trigonometric functions.
• Students will construct and interpret semilog and double-log plots used to model biological data.
• Students will justify results that require the use of theorems such as the Sandwich Theorem and Intermediate Value Theorem or mathematical definitions such as the definition of continuity by writing mathematical proofs.
• Students will be required to answer questions during lecture concerning topics discussed in class.
• Students will be required to explain verbally in class the connection between derivatives, rates of change, and slopes of tangent lines.
• Students will explain the solutions to related rates problems and optimizations problems in writing.
• Students will develop sketches of the graphs of complicated functions by analyzing the function itself and its first and second derivatives.
• Students will analyze the stability of fixed points by applying the cobwebbing graphical technique.
• Students will interpret definite integrals as sums of signed areas under a graph.

Empirical and Quantitative Skills
• Students will analyze semilog and double-log plots and derive functional relationships associated with such plots.
• Students will analyze population data and determine whether an exponential discrete time model can be used to model the data.
• Students will understand the Intermediate Value Theorem and apply it to locate the roots of functions.
• Students will compute derivatives of functions and use derivatives in applications such as finding equations of tangent lines, computing the linear approximation of a function, solving related rates problems, solving optimization problems, and finding the rate at which a population is growing.
• Students will find the relationship between two given rates of change and make conclusions about how one is affecting the other.
• Students will make conclusions about monotonicity, concavity, extrema, and inflection points of a given function by analyzing the given function and its derivatives.
• Students will manipulate given information to develop a one-variable function to be used in an optimization problem and then apply calculus to find and interpret the optimal solution.
• Students will use antiderivatives and the Fundamental Theorem of Calculus to compute and interpret areas under curves.
Math 147 - Fall 2013
Texas A&M University

Instructor: Heather Ramsey
Email: ramsey@math.tamu.edu
Website: http://www.math.tamu.edu/~ramsey/

Office: Blocker 638
Office hours: MW 12:30pm-2pm and by appointment

<table>
<thead>
<tr>
<th>Section</th>
<th>Days</th>
<th>Time</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>504, 505, 506 Lecture</td>
<td>TR</td>
<td>9:35am-10:50am</td>
<td>BLOC 169</td>
</tr>
<tr>
<td>504 Recitation</td>
<td>MW</td>
<td>11:30am-12:20pm</td>
<td>BLOC 149</td>
</tr>
<tr>
<td>505 Recitation</td>
<td>MW</td>
<td>1:50pm-2:40pm</td>
<td>BLOC 180</td>
</tr>
<tr>
<td>506 Recitation</td>
<td>MW</td>
<td>8:00am-8:50am</td>
<td>C E 222</td>
</tr>
</tbody>
</table>

Class Times and Locations:

<table>
<thead>
<tr>
<th>Section</th>
<th>Days</th>
<th>Time</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>507, 508, 509 Lecture</td>
<td>TR</td>
<td>12:45pm-2:00pm</td>
<td>BLOC 169</td>
</tr>
<tr>
<td>507 Recitation</td>
<td>MW</td>
<td>8:00am-8:50am</td>
<td>BLOC 164</td>
</tr>
<tr>
<td>508 Recitation</td>
<td>MW</td>
<td>3:00pm-3:50pm</td>
<td>BLOC 148</td>
</tr>
<tr>
<td>509 Recitation</td>
<td>MW</td>
<td>4:10pm-5:00pm</td>
<td>BLOC 148</td>
</tr>
</tbody>
</table>


Course Goal: The goal of this course is to introduce students to differential and integral calculus in a context that emphasizes applications in the biological sciences. First semester topics will include limits, continuity, differentiation, differentiation techniques and applications, integration, integration techniques and applications. Note: A tentative schedule for this course, including the topics to be taught, can be found on my web page. A brief summary of the lecture schedule is given at the end of this syllabus.

Email Policy: Check your TAMU email account EVERY day. You are responsible for any information I send via email. If you send an email to me, be sure to include your full name and section number in the message. NOTE: Because of privacy rights, I cannot discuss grades via email or over the phone.

Cell Phone/Laptop Computer Policy: As a courtesy to me and your classmates, all cell phones and laptop computers (and other electronic devices) must be OFF and put away during lecture. If you disrupt class or distract your neighbor with your cell phone or other electronic device, you will be asked to leave class.

Grading Policy: Grades will be calculated according to the following percentages:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three Evening Exams</td>
<td>18% each</td>
</tr>
<tr>
<td>Quizzes</td>
<td>15%</td>
</tr>
<tr>
<td>Recitation Assignments</td>
<td>8%</td>
</tr>
<tr>
<td>Comprehensive Final Exam</td>
<td>23%</td>
</tr>
</tbody>
</table>

A = 90-100%
B = 80-89%
C = 70-79%
D = 60-69%
F = below 60%

Note: Any questions regarding grading/scoring must be made within one week of the return of the exam or quiz or no change in the grade will be made.

Make-up Policy: No make-ups will be given without written evidence of an official University excused absence. (See University Student Rules.) According to Section 7.3 of the University Student Rules, for an absence to be considered excused,

the student must notify his or her instructor in writing (acknowledged e-mail message is acceptable) prior to the date of absence if such notification is feasible. In cases where advance notification is not feasible (e.g. accident or emergency) the student must provide notification
by the end of the second working day after the absence. This notification should include an
explanation of why notice could not be sent prior to the class.

If no such notice is given, the rights to a make-up are forfeited. In addition (and also in accordance with
University Student Rules), a written excuse must be presented upon return to class. Specifically, in the
case of illness or injury, students are required to obtain a confirmation note from a health care professional
confirming date and time of a medical office visit regarding the illness or injury. I will NOT accept the
Explanatory Statement for Absence from Class form as sufficient written documentation of an excused
absence.

**Exams:** There will be three even evening exams on the dates listed below, each from 7:30pm-9:30pm, and a
comprehensive final, scheduled as shown below. I will NOT curve test grades.

<table>
<thead>
<tr>
<th>Tentative Exam Schedule</th>
<th>Final Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exam 1: Thursday, Sept. 27</td>
<td>Sections 504, 505, 506: Friday, Dec. 7, 12:30pm-2:30pm</td>
</tr>
<tr>
<td>Exam 2: Thursday, Oct. 25</td>
<td>Sections 507, 508, 509: Wednesday, Dec. 12, 8am-10am</td>
</tr>
<tr>
<td>Exam 3: Tuesday, Nov. 27</td>
<td></td>
</tr>
</tbody>
</table>

**Quizzes:** Announced and unannounced quizzes and will be given throughout the semester during Wednes-
day recitations and occasionally during lecture. Each quiz will be graded on a 10-point scale, and no
make-up quizzes will be given without written verification of a University excused absence.

One quiz grade will be dropped.

**Recitation Assignments:** A set of problems will be assigned during recitation each Monday and will
be due during that class period. Students may work on these problems in groups of up to three. These
assignments will be graded on a 10-point scale, and since only the best 8 scores will be used to obtain the
recitation assignment average, no make ups will be allowed for missed recitation assignments.

**Homework Assignments:** Homework assignments will be posted on the course website. These assign-
ments will not be collected for a grade, but completing them is essential to doing well in the course.

**Attendance:** I STRONGLY suggest that you make every attempt to not miss a single day of lecture or
recitation. Falling behind in this course can be very detrimental to your grade.

**Calculator Policy:** Students will be allowed to use a scientific calculator on most quizzes and exams, with
potentially a few exceptions. No graphing calculators, cell phone calculators, or any other electronic device
calculators will be allowed.

**Scholastic Dishonesty:** You are encouraged to work together on the homework assignments, but do
not copy another student's work. Copying work done by others, either in class or out of class, is an act
of scholastic dishonesty and will be prosecuted to the full extent allowed by University policy. Using an
unauthorized calculator during an exam or quiz will result in a zero on the assignment. Also, cell phone
use during an exam, quiz, or recitation assignment will result in a zero on the assignment. Always abide by
the Aggie Code of Honor. *An Aggie does not lie, cheat, or steal or tolerate those who do.* Please refer to
Honor Council Rules and Procedures at [http://www.tamu.edu/aggiehonor](http://www.tamu.edu/aggiehonor) for more information on academic
integrity and scholastic dishonesty. **I have served as a member of the Aggie Honor Council, so I
take these matters very seriously.**

**Extra Help and Preparing for Exams:**

- **Your Instructor:** I want each and every one of my students to be successful in this class. Please
  feel free to ask questions in class. If you need more help, come by my office during office hours or
  make an appointment to see me. Remember, I am here to help, but I cannot do that if I don't know
  that there is a problem.
- **Recitation and TA:** You will attend recitation with a teaching assistant twice per week. During these class periods, you will be able to ask the TA to explain homework problems and review any topics from lecture, so be sure to take advantage of this class time.

- **Your Classmates:** Get to know your classmates. Form study groups and work on suggested problems outside of class.

- **Practice:** Working ALL of the suggested homework problems from your textbook is essential to doing well in this course. If you struggle with these problems the first time you work them, be sure to work them again AND work other problems from the textbook that are similar. I strongly recommend that you practice problems **DAILY**.

- **Week-in-Review Problem Sets:** Although the Math Department will not be hosting live Week-in-Review sessions during this fall semester, problem sets and solutions from a previous semester can be found on my webpage. Many of these problems came from previous exams, so I highly recommend working them as a way to prepare for quizzes and exams.

- **Free Tutoring!!! (a.k.a. Help Sessions):** Help sessions are an opportunity for you to ask questions and get help with your homework. The schedule for fall help sessions can be found on my webpage. These sessions are come-and-go, i.e., you can come at any point during the help session and leave whenever you want.

**ADA Policy Statement:** The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Department of Student Life, Services for Students with Disabilities, in Room B118 of the Cain Hall or call 845-1637.

**Copyright Policy:** All printed materials including (but not limited to) handouts, quizzes, exams, and information found on the web are protected by copyright laws. One xerox copy (or download from the web) is allowed for personal use. Multiple copies or the sale of any of these materials is strictly prohibited and will be prosecuted to the full extent of the law.

**Weekly Lecture Schedule:** Roughly speaking, we should cover the following material from the textbook by Neuhauser on the following schedule:

<table>
<thead>
<tr>
<th>Week of Monday</th>
<th>Sections Covered</th>
<th>Week of Monday</th>
<th>Sections Covered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aug. 27</td>
<td>1.1, 1.2, 1.3</td>
<td>Oct. 22</td>
<td>5.2, 5.3, Exam 2</td>
</tr>
<tr>
<td>Sept. 3</td>
<td>1.3, 3.1</td>
<td>Oct. 29</td>
<td>5.4, 5.5</td>
</tr>
<tr>
<td>Sept. 10</td>
<td>3.2, 3.3, 3.4</td>
<td>Nov. 5</td>
<td>2.1, 2.2, 2.3</td>
</tr>
<tr>
<td>Sept. 17</td>
<td>3.5, 4.1</td>
<td>Nov. 12</td>
<td>5.6, 2.3 (continued)</td>
</tr>
<tr>
<td>Sept. 24</td>
<td>4.2, 4.3, Exam 1</td>
<td>Nov. 19</td>
<td>6.1, 6.2</td>
</tr>
<tr>
<td>Oct. 1</td>
<td>4.4, 4.5</td>
<td>Nov. 26</td>
<td>6.2, 7.1, Exam 3</td>
</tr>
<tr>
<td>Oct. 8</td>
<td>4.6, 4.7</td>
<td>Dec. 3</td>
<td>6.3, Review</td>
</tr>
<tr>
<td>Oct. 15</td>
<td>4.8, 5.1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Texas A&M University
Core Curriculum Cover Sheet
Initial Request for a course to be considered for the Fall 2014 Core Curriculum

1. This request is submitted by (department name): Mathematics

2. Course prefix and number: Math 148
3. Texas Common Course Number: Click here to enter text.

4. Complete course title: Calculus II for Biological Sciences
5. Semester credit hours: 4

6. This request is for consideration in the following Foundational Component Area:
   □ Communication
   □ Creative Arts
   X Mathematics
   □ American History
   □ Government/Political Science
   □ Life and Physical Sciences
   □ Social and Behavioral Sciences
   □ Language, Philosophy and Culture

7. This course should also be considered for International and Cultural Diversity (ICD) designation:
   □ Yes   X  No

8. How frequently will the class be offered? Fall, Spring

9. Number of class sections per semester: Fall= 3 (2013) Spring average= 9

10. Number of students per semester: Fall= (2013) Spring average= 157
    2011-2012 2010-2011 2009-2010
    159 149 162

11. Historic annual enrollment for the last three years:

This completed form must be attached to a course syllabus that sufficiently and specifically details the appropriate core objectives through multiple lectures, outside activities, assignments, etc. Representative from department submitting request should be in attendance when considered by the Core Curriculum Council.

13. Submitted by: [Signature]
    Course Instructor

14. Department Head
    [Signature]

15. College Dean/Designee
    [Signature]

For additional information regarding core curriculum, visit the Texas Higher Education Coordinating Board website at www.thecb.state.tx.us/corecurriculum2014

See form instructions for submission/approval process.

March 28, 2013
Date

April 04, 2013
550
Texas A&M University
Texas A&M University  
Core Curriculum  
Initial Request for a Course Addition to the Fall 2014 Core Curriculum  

Foundational Component Area: Mathematics

In the box below, describe how this course meets the Foundational Component Area description for Mathematics. Courses in this category focus on quantitative literacy in logic, patterns, and relationships. Courses involve the understanding of key mathematical concepts, and the application of appropriate quantitative tools to everyday experience.

The proposed course must contain all elements of the Foundational Component Area. How does the proposed course specifically address the Foundational Component Area definition above?

This course is focused on quantitative literacy in mathematics with an emphasis on real-world applications, especially to the biological sciences. Upon successful completion of this course, students will be able to:

- apply techniques for integration, including integration by parts and partial fraction decomposition.
- identify and compute improper integrals using limits.
- justify why an improper integral converges or diverges by applying the comparison theorem.
- approximate functions with Taylor polynomials and evaluate the error in the approximation by using the Taylor inequality.
- solve separable ordinary differential equations.
- understand how exponential population growth is modeled by a constant per capita growth rate while logistic population growth incorporates density dependence.
- find equilibria of differential equations and analyze their stability both graphically and by using the stability criterion.
- apply various techniques for solving systems of equations, including Gaussian elimination.
- apply basic matrix algebra skills including addition, subtraction, scalar multiplication, and multiplication of matrices and find the inverse of a matrix and be able to use matrix algebra to solve problems.
- compute and interpret eigenvalues and eigenvectors for $2 \times 2$ matrices.
- use matrices in biological applications, including the study of age-structured populations.
- interpret $2 \times 2$ linear maps applied to $2 \times 1$ vectors.
- add, subtract, and scale vectors and compute dot products.
- use vectors in applications, including finding equations of lines and planes.
- understand concepts of limits and continuity for multivariable functions.
- use partial derivatives and linear approximations for solving real-world problems.
- understand and explain the concepts of equilibria and stability for biological systems of difference equations.
- correctly solve applied problems, and write the solutions in a coherent fashion.
- construct and analyze linear and nonlinear systems of differential equations applied in biology and medicine.

Core Objectives

Describe how the proposed course develops the required core objectives below by indicating how each learning objective will be addressed, what specific strategies will be used for each objective and how student learning of each objective will be evaluated.

The proposed course is required to contain each element of the Core Objective.

Critical Thinking (to include creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information):
Texas A&M University
Core Curriculum
Initial Request for a Course Addition to the Fall 2014 Core Curriculum

The following critical thinking skills will be assessed on exams and other assignments. Students will:
- Analyze integrals and determine the proper technique for integration, including the integration by parts and partial fraction decomposition methods.
- Identify and compute improper integrals using limits.
- Approximate functions with Taylor polynomials and evaluate the error in the approximation by using the Taylor inequality.
- Solve separable ordinary differential equations.
- Find equilibria of differential equations and analyze their stability both graphically and by using the stability criterion.
- Apply techniques for solving systems of equations, including Gaussian elimination.
- Learn basic matrix algebra skills including addition, subtraction, scalar multiplication, and multiplication of matrices and be able to find the inverse of a matrix.
- Creatively apply matrix algebra to solve systems of equations.
- Compute and interpret eigenvalues and eigenvectors for $2 \times 2$ matrices.
- Understand and apply concepts of limits and continuity for multivariable functions.
- Compute partial derivatives and linear approximations to solve real-world problems.
- Compute equilibria and analyze their stability for biological systems of difference equations.
- Solve applied problems, and write the solutions in a coherent fashion.
- Analyze and construct linear and nonlinear systems of differential equations applied in biology and medicine.

Communication (to include effective development, interpretation and expression of ideas through written, oral and visual communication):

The following communication skills will be assessed on exams, during lecture, and on other assignments. Students will:
- Justify why an improper integral converges or diverges by applying the comparison theorem.
- Understand how exponential population growth is modeled by a constant per capita growth rate while logistic population growth incorporates density dependence.
- Find equilibria of differential equations and analyze their stability both graphically and by using the stability criterion.
- Apply basic matrix algebra skills including addition, subtraction, scalar multiplication, and multiplication of matrices and finding the inverse of a matrix to solving problems.
- Interpret the action of $2 \times 2$ linear maps applied to $2 \times 1$ vectors both graphically and numerically.
- Add, subtract, and scale vectors and compute dot products.
- Use vectors in applications, including finding equations of lines and planes.
- Solve applied problems, and write the solutions in a coherent fashion.
- Construct and analyze linear and nonlinear systems of differential equations applied in biology and medicine.

Empirical and Quantitative Skills (to include the manipulation and analysis of numerical data or observable facts resulting in informed conclusions):

The following empirical and quantitative skills will be assessed on exams and other assignments. Students will:
- Apply techniques for integration, including integration by parts and partial fraction decomposition.
- Solve separable ordinary differential equations.
- Find equilibria of differential equations and analyze their stability both graphically and by using the stability criterion.
- Compute and interpret eigenvalues and eigenvectors for $2 \times 2$ matrices.
- Compute the Leslie matrix associated with a given data set pertaining to an age-structured population and use it to make predictions of population sizes for future generations.
Texas A&M University

Core Curriculum

Initial Request for a Course Addition to the Fall 2014 Core Curriculum

- Use partial derivatives and linear approximations for solving real-world problems.
- Compute equilibria and analyze their stability for biological systems of difference equations.
- Manipulate given information to construct and analyze linear and nonlinear systems of differential equations applied in biology and medicine.

Please be aware that instructors should be prepared to submit samples/examples of student work as part of the future course recertification process.
Catalog Title and Description: (CREDIT 4.0) Calculus II for Biological Sciences – Introduction to integral calculus in a context that emphasizes applications in the biological sciences; ordinary differential equations and analytical geometry. Prerequisite: MATH 147 or approval of instructor. Credit will not be given for more than one of MATH 148, MATH 152 and MATH 172.

Learning Outcomes: This course is focused on quantitative literacy in mathematics with an emphasis on real world applications, especially to the biological sciences. Upon successful completion of this course, students will be able to

- apply techniques for integration, including integration by parts and partial fraction decomposition.
- identify and compute improper integrals using limits.
- justify why an improper integral converges or diverges by applying the comparison theorem.
- approximate functions with Taylor polynomials and evaluate the error in the approximation by using the Taylor inequality.
- solve separable ordinary differential equations.
- understand how exponential population growth is modeled by a constant per capita growth rate while logistic population growth incorporates density dependence.
- find equilibria of differential equations and analyze their stability both graphically and by using the stability criterion.
- apply various techniques for solving systems of equations, including Gaussian elimination.
- apply basic matrix algebra skills including addition, subtraction, scalar multiplication, and multiplication of matrices and find the inverse of a matrix and be able to use matrix algebra to solve problems.
- compute and interpret eigenvalues and eigenvectors for $2 \times 2$ matrices.
- use matrices in biological applications, including the study of age-structured populations.
- interpret $2 \times 2$ linear maps applied to $2 \times 1$ vectors.
- add, subtract, and scale vectors and compute dot products.
- use vectors in applications, including finding equations of lines and planes.
- understand concepts of limits and continuity for multivariable functions.
- use partial derivatives and linear approximations for solving real-world problems.
- understand and explain the concepts of equilibria and stability for biological systems of difference equations.
- correctly solve applied problems, and write the solutions in a coherent fashion.
- construct and analyze linear and nonlinear systems of differential equations applied in biology and medicine.

Core Objectives

Critical Thinking

The following critical thinking skills will be assessed on exams and other assignments. Students will:

- Analyze integrals and determine the proper technique for integration, including the integration by parts and partial fraction decomposition methods.
- Identify and compute improper integrals using limits.
- Approximate functions with Taylor polynomials and evaluate the error in the approximation by using the Taylor inequality.
- Solve separable ordinary differential equations.
- Find equilibria of differential equations and analyze their stability both graphically and by using the stability criterion.
- Apply techniques for solving systems of equations, including Gaussian elimination.
• Learn basic matrix algebra skills including addition, subtraction, scalar multiplication, and multiplication of matrices and be able to find the inverse of a matrix.
• Creatively apply matrix algebra to solve systems of equations.
• Compute and interpret eigenvalues and eigenvectors for $2 \times 2$ matrices.
• Understand and apply concepts of limits and continuity for multivariable functions.
• Compute partial derivatives and linear approximations to solve real-world problems.
• Compute equilibria and analyze their stability for biological systems of difference equations.
• Solve applied problems, and write the solutions in a coherent fashion.
• Analyze and construct linear and nonlinear systems of differential equations applied in biology and medicine.

Communication Skills
The following communication skills will be assessed on exams, during lecture, and on other assignments. Students will:
• Justify why an improper integral converges or diverges by applying the comparison theorem.
• Understand how exponential population growth is modeled by a constant per capita growth rate while logistic population growth incorporates density dependence.
• Find equilibria of differential equations and analyze their stability both graphically and by using the stability criterion.
• Apply basic matrix algebra skills including addition, subtraction, scalar multiplication, and multiplication of matrices and finding the inverse of a matrix to solving problems.
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• Add, subtract, and scale vectors and compute dot products.
• Use vectors in applications, including finding equations of lines and planes.
• Solve applied problems, and write the solutions in a coherent fashion.
• Construct and analyze linear and nonlinear systems of differential equations applied in biology and medicine.

Empirical and Quantitative Skills
The following empirical and quantitative skills will be assessed on exams and other assignments. Students will:
• Apply techniques for integration, including integration by parts and partial fraction decomposition.
• Solve separable ordinary differential equations.
• Find equilibria of differential equations and analyze their stability both graphically and by using the stability criterion.
• Compute and interpret eigenvalues and eigenvectors for $2 \times 2$ matrices.
• Compute the Leslie matrix associated with a given data set pertaining to an age-structured population and use it to make predictions of population sizes for future generations.
• Use partial derivatives and linear approximations for solving real-world problems.
• Compute equilibria and analyze their stability for biological systems of difference equations.
• Manipulate given information to construct and analyze linear and nonlinear systems of differential equations applied in biology and medicine.
Math 148 - Fall 2013

Instructor: Heather Ramsey
Email: ramsey@math.tamu.edu
Website: http://www.math.tamu.edu/~ramsey/

Office: Blocker 638
Office hours: Mon 1pm-2pm, Tue 4pm-5pm
Wednesdays 10am 12pm and by appointment

Section  
501, 502, 503 Lecture  TR  11:10am-12:25pm  BLOC 166  
501 Recitation  MW  1:50pm-2:40pm  BLOC 148  
502 Recitation  MW  3:00pm-3:50pm  BLOC 148  
503 Recitation  MW  4:10pm-5:00pm  CE 223

Class Times and Locations:

504, 505, 506 Lecture  TR  9:35am-10:50am  BLOC 166  
504 Recitation  MW  12:40pm-1:30pm  BLOC 164  
505 Recitation  MW  1:50pm-2:40pm  ZACH 119D  
506 Recitation  MW  3:00pm-3:50pm  ZACH 119D

ISBN: 9780321644688

Catalog Title and Description: (CREDIT 4.0) Calculus II for Biological Sciences - Introduction to integral calculus in a context that emphasizes applications in the biological sciences; ordinary differential equations and analytical geometry. Prerequisite: MATH 147 or approval of instructor. Credit will not be given for more than one of MATH 148, MATH 152 and MATH 172.

Course Goal: The goal of this course is to introduce students to integral calculus and differential equations in a context that emphasizes applications in the biological sciences. Second semester topics will include integration techniques and applications; solving systems of ordinary differential equations; topics in linear algebra and analytic geometry; functions of several variables, differentiability, and applications; and solving systems of differential equations. Note: A tentative schedule for this course, including the topics to be taught, can be found on my web page. A brief summary of the lecture schedule is given at the end of this syllabus.

Email Policy: Check your TAMU email account EVERY day. You are responsible for any information I send via email. If you send an email to me, be sure to include your full name and section number in the message. NOTE: Because of privacy rights, I cannot discuss grades via email or over the phone.

Cell Phone/Laptop Computer Policy: As a courtesy to me and your classmates, all cell phones and laptop computers (and other electronic devices) must be OFF and put away during lecture. If you disrupt class or distract your neighbor or distract me with your cell phone or other electronic device, you may be asked to leave class.

Grading Policy: Grades will be calculated according to the following percentages:
| Three Evening Exams | 18% each | A = 90-100% |
| Quizzes             | 15%      | B = 80-89%  |
| Recitation Assignments | 8%     | C = 70-79%  |
| Comprehensive Final Exam | 23%    | D = 60-69%  |
|                     |          | F = below 60% |

Note: Any questions regarding grading/scoring must be made within one week of the return of the exam or quiz or no change in the grade will be made.

Make-up Policy: No make-ups will be given without written evidence of an official University excused absence. (See University Student Rules.) According to Section 7.3 of the University Student Rules, for an absence to be considered excused,

the student must notify his or her instructor in writing (acknowledged e-mail message is acceptable) prior to the date of absence if such notification is feasible. In cases where advance notification is not feasible (e.g. accident or emergency) the student must provide notification by the end of the second working day after the absence. This notification should include an explanation of why notice could not be sent prior to the class.

If no such notice is given, the rights to a make-up are forfeited. In addition (and also in accordance with University Student Rules), a written excuse must be presented upon return to class. Specifically, in the case of illness or injury, students are required to obtain a confirmation note from a health care professional affirirming date and time of a medical office visit regarding the illness or injury. I will NOT accept the Explanatory Statement for Absence from Class form as sufficient written documentation of an excused absence.

Exams: There will be three evening exams on the dates listed below, each from 7:30pm-9:30pm, and a comprehensive final, scheduled as shown below. I will NOT curve test grades, but if your score on your comprehensive final exam is greater than your lowest score on the first three exams, then I will replace your lowest exam score with the score earned on the final exam. Only one grade replacement is possible.

<table>
<thead>
<tr>
<th>Tentative Exam Schedule</th>
<th>Final Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exam 1 : Thursday, Feb 14</td>
<td>Sections 501, 502, 503: Friday, May 3, 3pm-5pm</td>
</tr>
<tr>
<td>Exam 2 : Thursday, Mar. 21</td>
<td>Sections 504, 505, 506: Friday, May 3, 12:30pm-2:30pm</td>
</tr>
<tr>
<td>Exam 3 : Tuesday, Apr. 23</td>
<td></td>
</tr>
</tbody>
</table>

Quizzes: Announced and unannounced quizzes and will be given throughout the semester during Wednesday recitations and occasionally during lecture. Each quiz will be graded on a 10-point scale, and no make-up quizzes will be given without written verification of a University excused absence. One quiz grade will be dropped.

Recitation Assignments: A set of problems will be assigned during recitation each Monday and will be due during that class period. Students may work on these problems in groups of up to three. These assignments will be graded on a 10-point scale, and since only the best 8 scores will be used to obtain the recitation assignment average, no make ups will be allowed for missed recitation assignments.

Homework Assignments: Homework assignments will be posted on the course website. These assignments will not be collected for a grade, but completing them is essential to doing well in the course.

Attendance: I STRONGLY suggest that you make every attempt to not miss a single day of lecture or
recitation. Falling behind in this course can be very detrimental to your grade.

**Calculator Policy:** Students will be allowed to use a scientific calculator on most quizzes and exams, with potentially a few exceptions. No graphing calculators, cell phone calculators, or any other electronic device will be allowed.

**Scholastic Dishonesty:** You are encouraged to work together on the homework assignments, but do not copy another student's work. Copying work done by others, either in class or out of class, is an act of scholastic dishonesty and will be prosecuted to the full extent allowed by University policy. Using an unauthorized calculator during an exam or quiz will result in a zero on the assignment. Also, cell phone use during an exam, quiz, or recitation assignment will result in a zero on the assignment. Always abide by the Aggie Code of Honor: *An Aggie does not lie, cheat, or steal or tolerate those who do.* Please refer to Honor Council Rules and Procedures at http://www.tamu.edu/aggiehonor for more information on academic integrity and scholastic dishonesty. I have served as a member of the Aggie Honor Council, so I take these matters very seriously.

**Extra Help and Preparing for Exams:**

- **Your Instructor:** I want each and every one of my students to be successful in this class. Please feel free to ask questions in class. If you need more help, come by my office during office hours or make an appointment to see me. Remember, I am here to help, but I cannot do that if I don’t know that there is a problem.

- **Recitation and TA:** You will attend recitation with a teaching assistant twice per week. During these class periods, you will be able to ask the TA to explain homework problems and review any topics from lecture, so be sure to take advantage of this class time.

- **Your Classmates:** Get to know your classmates. Form study groups and work on suggested problems outside of class.

- **Practice:** Working ALL of the suggested homework problems from your textbook is essential to doing well in this course. If you struggle with these problems the first time you work them, be sure to work them again AND work other problems from the textbook that are similar. I strongly recommend that you practice problems DAILY.

- **Free Tutoring!!! (a.k.a. Help Sessions):** Help sessions are an opportunity for you to ask questions and get help with your homework. The schedule for spring help sessions can be found on my webpage. These sessions are come-and-go, i.e., you can come at any point during the help session and leave whenever you want.

**ADA Policy Statement:** The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Department of Student Life, Services for Students with Disabilities, in Room B118 of the Cain Hall or call 845-1637.

**Copyright Policy:** All printed materials including (but not limited to) handouts, quizzes, exams, and information found on the web are protected by copyright laws. One xerox copy (or download from the web)
is allowed for personal use. Multiple copies or the sale of any of these materials is strictly prohibited and will be prosecuted to the full extent of the law.

**Weekly Lecture Schedule**: Roughly speaking, we should cover the following material from the textbook by Neuhauser on the following schedule:

<table>
<thead>
<tr>
<th>Week of Monday</th>
<th>Sections Covered</th>
<th>Week of Monday</th>
<th>Sections Covered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan. 14</td>
<td>7.2, 7.3</td>
<td>Mar. 18</td>
<td>10.4</td>
</tr>
<tr>
<td>Jan. 21</td>
<td>7.3, 7.4, 7.6</td>
<td>Mar. 25</td>
<td>10.5.1, 10.6.1</td>
</tr>
<tr>
<td>Jan. 28</td>
<td>7.6, 8.1</td>
<td>Apr. 1</td>
<td>10.6.1, 10.7</td>
</tr>
<tr>
<td>Feb. 4</td>
<td>8.1, 8.2</td>
<td>Apr. 8</td>
<td>11.1, 11.2</td>
</tr>
<tr>
<td>Feb. 11</td>
<td>9.1</td>
<td>Apr. 15</td>
<td>11.3</td>
</tr>
<tr>
<td>Feb. 18</td>
<td>9.2, 9.3</td>
<td>Apr. 22</td>
<td>11.4</td>
</tr>
<tr>
<td>Feb. 25</td>
<td>9.4, 10.1, 10.2</td>
<td>Apr. 29</td>
<td>Review</td>
</tr>
<tr>
<td>Mar. 4</td>
<td>10.2, 10.3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Texas A&M University

Core Curriculum Cover Sheet

Initial Request for a course to be considered for the Fall 2014 Core Curriculum

1. This request is submitted by (department name): Mathematics

2. Course prefix and number: Math 150

3. Texas Common Course Number: 2412

4. Complete course title: Functions, Trigonometry & Linear System

5. Semester credit hours: 4

6. This request is for consideration in the following Foundational Component Area:
   - [x] Communication
   - [ ] Creative Arts
   - [x] Mathematics
   - [x] American History
   - [ ] Life and Physical Sciences
   - [ ] Government/Political Science
   - [ ] Language, Philosophy and Culture
   - [ ] Social and Behavioral Sciences

7. This course should also be considered for International and Cultural Diversity (ICD) designation:
   - [x] Yes
   - [ ] No

8. How frequently will the class be offered?: Fall & Spring

9. Number of class sections per semester:
   - Fall average = 32
   - Spring average = 6

10. Number of students per semester:
    - Fall average = 761
    - Spring average = 95

11. Historic annual enrollment for the last three years:
    - 2011-2012: 880
    - 2010-2011: 869
    - 2009-2010: 819

This completed form must be attached to a course syllabus that sufficiently and specifically details the appropriate core objectives through multiple lectures, outside activities, assignments, etc. Representative from department submitting request should be in attendance when considered by the Core Curriculum Council.

13. Submitted by: Sherry J. Scarbrough

   Course Instructor

   Approvals:

   Department Head

   College Dean/Designee

   3.26.2013

   Date

   3/29/13

   Date

   4/1/13

   Date

For additional information regarding core curriculum, visit the Texas Higher Education Coordinating Board website at www.thecb.state.tx.us/corecurriculum2014

See form instructions for submission/approval process.
Texas A&M University

Core Curriculum

Initial Request for a Course Addition to the Fall 2014 Core Curriculum

Foundational Component Area: Mathematics

In the box below, describe how this course meets the Foundational Component Area description for Mathematics. Courses in this category focus on quantitative literacy in logic, patterns, and relationships. Courses involve the understanding of key mathematical concepts, and the application of appropriate quantitative tools to everyday experience.

The proposed course must contain all elements of the Foundational Component Area. How does the proposed course specifically address the Foundational Component Area definition above?

This course is focused on quantitative literacy in mathematics in order to prepare students for calculus. Upon successful completion of this course, student will be able to

- Perform operations (adding, subtracting, multiplying, dividing) on real numbers, complex numbers, functions, exponents, radicals and vectors
- Graph relations, functions, and vectors
- Solve an equation, a system of equations, and inequalities
- Identify characteristics of a particular function
- Comprehend and solve an application problem (time-to-do work, distance = rate x time, mixtures)
- Understand the importance of domain and be able to find the domain
- Apply exponential functions and logarithmic functions
- Understand and apply basic trigonometry

Core Objectives

Describe how the proposed course develops the required core objectives below by indicating how each learning objective will be addressed, what specific strategies will be used for each objective and how student learning of each objective will be evaluated.

The proposed course is required to contain each element of the Core Objective.

Critical Thinking (to include creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information):

The following critical thinking skills will be assessed on in-class quizzes and exams. Students will

- Think creatively to discern what technique is needed to simplify an expression, or solve an equation or application.
- Analyze functions and their inverses, if they exist.
- Use inquiry to determine if they need to check the domain or check for extraneous solutions after solving an equation.
- Synthesize inverse functions and unique triangles to solve for all of the sides and angles of a triangle
- Translate movement into a resulting vector

Communication (to include effective development, interpretation and expression of ideas through written, oral and visual communication):

The following communication skills will be assessed on in-class quizzes, exams and in lecture. Students will

- Transform functions through shifts, stretches, shrinks, and reflections
- Interpret graphs and be able to identify their basic parent functions
- Create a sign-chart model to solve non-linear inequalities
Texas A&M University
Core Curriculum

Initial Request for a Course Addition to the Fall 2014 Core Curriculum

• Interpret a solution, including any units, to an application problem
• Be required to answer questions during class concerning topics discussed in class
• Discuss with others approaches and solutions to problems in the required recitation

Empirical and Quantitative Skills (to include the manipulation and analysis of numerical data or observable facts resulting in informed conclusions):

The following empirical and quantitative skills will be assessed on in-class quizzes and exams. Students will
• Solve application problems and draw conclusions regarding the mathematical answer.
• Logically prove if a function is a one-to-one function or not, if a relation is even, odd or neither, or if a trigonometric equation is an identity or not.
• Identify the domains, range, intercepts, symmetries, zeros, and asymptotes of a function or graph.
• Analyze an exponential or logarithmic application, including half-life problem, to determine what technique is needed to solve the problem.
• Transform numerical data into a functional model.
• Understand and apply the difference quotient to various types of functions.

Please be aware that instructors should be prepared to submit samples/examples of student work as part of the future course recertification process.
Math 150 Functions, Trigonometry, and Linear Systems

Course Description: Math 150: Functions, Trigonometry, and Linear Systems. (3-2). Credit 4. Graphs, functions, college algebra and trigonometry, linear systems and vectors.

Learning Outcomes
This course is focused on quantitative literacy in mathematics in order to prepare students for calculus. Upon successful completion of this course, student will be able to

- Perform operations (adding, subtracting, multiplying, dividing) on real numbers, complex numbers, functions, exponents, radicals and vectors
- Graph relations, functions, and vectors
- Solve an equation, a system of equations, and inequalities
- Identify characteristics of a particular function
- Comprehend and solve an application problem (time-to-do work, distance = rate × time, mixtures)
- Understand the importance of domain and be able to find the domain
- Apply exponential functions and logarithmic functions
- Understand and apply basic trigonometry

Core Objectives

Critical Thinking
The following critical thinking skills will be assessed on in-class quizzes and exams. Students will

- Think creatively to discern what technique is needed to simplify an expression, or solve an equation or application.
- Analyze functions and their inverses, if they exist.
- Use inquiry to determine if they need to check the domain or check for extraneous solutions after solving an equation.
- Synthesize inverse functions and unique triangles to solve for all of the sides and angles of a triangle
- Translate movement into a resulting vector

Communication Skills
The following communication skills will be assessed on in-class quizzes, exams and in lecture. Students will

- Transform functions through shifts, stretches, shrinks, and reflections
- Interpret graphs and be able to identify their basic parent functions
- Create a sign-chart model to solve non-linear inequalities
- Interpret a solution, including any units, to an application problem
- Be required to answer questions during class concerning topics discussed in class
- Discuss with others approaches and solutions to problems in the required recitation

Empirical and Quantitative Skills
The following empirical and quantitative skills will be assessed on in-class quizzes and exams. Students will

- Solve application problems and draw conclusions regarding the mathematical answer.
- Logically prove if a function is a one-to-one function or not, if a relation is even, odd or neither, or if a trigonometric equation is an identity or not.
- Identify the domains, range, intercepts, symmetries, zeros, and asymptotes of a function or graph.
- Analyze an exponential or logarithmic application, including half-life problem, to determine what technique is needed to solve the problem.
- Transform numerical data into a functional model.
- Understand and apply the difference quotient to various types of functions.
Instructor: Dr. Sherry Scarborough  
Office: 629B Blocker  
Email Address: sherry.scarborough@math.tamu.edu  
Emails: In all correspondence, please include your name, your course number, and your section number in the subject line. Please regularly check your TAMU email, as I often send the class emails.  
Web Site: http://www.math.tamu.edu/~Sherry_Scarborough/  
Dr. Sherry’s Office Hours: Mondays 3 – 4pm, Tuesdays 1:30–3pm, Thursdays 10:30am – 12pm  
Textbook: Online Textbook: PreCalculus (WebAlg) - 1e by David Manuel, Michael Stecher, and Patti Wells, which will be accessed via WebAssign, your online homework system.  
Class Notes: Class notes are found in your Math 150 class in http://elearning.tamu.edu/  
Calculator: No calculators are allowed on quizzes (individual or group worksheets) or exams. In-class calculator demonstrations will be done with a TI-83/84. It is recommended that you do as much of your online homework without the use of a calculator as you can.

Class Times  
- Sections 501-506: MWF 10:20 – 11:10am BLOC 166  
- Sections 507-512: MWF 11:30am – 12:20pm BLOC 166  
- Sections 525-530: MWF 1:50 – 2:40pm BLOC 166  

Recitation: Attendance in your recitation section is required, and you must attend the recitation section in which you are enrolled. Recitation sessions are led by a teaching assistant (TA) and meet once a week, every week, including the first week, depending upon your section number. You will be meeting in small sections to ask math questions of the TA, work group worksheet quizzes, take individual quizzes, and take individual exams. You will be assigned to a group during week two’s recitation.

Tentative Exam Schedule  
ODD SECTION NUMBERS  
Exam I September 17th and 18th  
Exam II October 15th and 16th  
Exam III November 12th and 13th  

EVEN SECTION NUMBERS  
Exam I September 18th and 19th  
Exam II October 16th and 17th  
Exam III November 13th and 14th  

Comprehensive Final Exam Schedule – [Actual schedule is unknown.]  
- Sections 501-506: Tuesday December 10 from 8 – 10am BLOC 166  
- Sections 507-512: Wednesday December 11 from 10:30am – 12:30pm BLOC 166  
- Sections 525-530: Tuesday December 10 from 3:30 – 5:30pm BLOC 166  

Grading: The average of your 3 regular exams (15% each) will count as 45% of your grade, your quiz average 15%, your online homework 15%, and your comprehensive final 25%. Due to confidentiality, grades will not be discussed via phone or email, only in person. Grade cutoffs: A is 90 – 100%, B is 80 – 89%, C is 70 – 79%, D is 60 – 69%, and F is 0 to 59%

Exams: You will need to bring to your exams your Texas A&M student ID, a #2 pencil and an eraser. You will also need Scantron form 882E for your recitation exams and for your comprehensive final exam. For your 3 regular exams, you will be taking part of your exam in recitation and part of your exam in lecture. The regular lecture exams will be workout. The recitation exams will be multiple-choice. The comprehensive final exam will be multiple choice and taken in the lecture room. No calculators, cameras or recording devices allowed.

Quizzes: Quizzes may be given in lecture or in recitation, and may or may not be announced ahead of time. Individual quizzes and group quiz worksheets may be in class or out of class. Some quizzes (group worksheets) will be done in assigned groups. Your note-card quiz assignment, which is due on or before your recitation the third week of school (September 10th or 12th), is found at the following web site: http://www.math.tamu.edu/~scarboro/150fall2013welcome.pdf. There will be no makeup quizzes since at the end of the semester your 2 lowest quiz grades are dropped, except your note-card grade. No calculators allowed on any quizzes.
WebAssign: All online homework will be based in the online system WebAssign.
- Everything you will need to know about creating an account and logging in is available here: http://www.math.tamu.edu/courses/ehomework/. Notice the important links on this website: WebAssign Login Page, Student Help Request Form (this is where you go if you are having any trouble with WebAssign), Student Information Page and FAQ. Now go to the Student Information Page and read the Math 150 link and ALL the links under Student Help Links.
- A WebAssign account has an access fee and you will need to “purchase access online” during the first two weeks of school. After that, you risk being locked out of the system and missing important assignments.
- At the end of the semester when final grades are calculated, 2 of your lowest online homework grades will be dropped.

Grade Disputes: Once you leave class with any graded paper you accept its grade, unless there is a totaling error. All grade disputes must be dealt with at the time you receive them. If the grade was not totaled correctly, you have one week from when the paper was first returned to the class to get the correction made.

Student ID: You will need to have your Texas A&M student ID with you for ALL classes.

Help Sessions: Help Sessions are a place to see homework-type problems worked and a place to get online homework help. Help Sessions usually start about the second week of school. There is a Help Session link on my Math 150 web page.

Week-In-Reviews (WIR): Weekly reviews will be given by Math 150 instructor Dr. Sherry Scarborough. These include an exam review on the week of your exam. WIR is not held the week immediately after an exam week. On my Math 150 web page are links to Week-In-Reviews for this semester as well as in the past. The WIR starts the second week of school. See http://www.math.tamu.edu/~scarboro/150fall2013wir.html for this semester's WIR.

Policies: Policies pertaining to absences, scholastic dishonesty and final examinations are identical to TAMU regulations. Students with an official excused absence are permitted to make up work only for the dates of the absence. All other assigned work, even that assigned on the excused date, is due as assigned.

Make-Up Policy: No make-up examinations will be given without a university approved excused absence (See the Texas A&M University Student Rules.). An absence for a non-acute medical service or regular check-up does not constitute an excused absence. To be excused you must notify Dr. Sherry by email prior to date of absence if such notification is feasible. Please note that all make-ups must go through me, though you are welcome to copy in your TA. Consistent with Texas A&M Student Rules, students are required to notify their instructor (Dr. Sherry) by the end of the second school day after missing an examination. For injury or illness too severe or contagious to attend class, you must provide confirmation of a visit to a health care professional affirming date and time of visit. The Texas A&M University Explanatory Statement for Absence from Class Form will NOT be accepted. It is the student's responsibility to schedule a makeup! Attendance is required in this course.

Late Policy: No late work will be accepted and no extensions on online homework problem sets will be granted without a verified TAMU University excused absence. Extensions will not be made after the due date since the answers are then available.

Copyright: All exams, printed handouts, class notes, assignments, online homework problems, quizzes, worksheets, and web-materials are protected by U.S. Copyright Laws. No multiple copies can be made without my written permission. No exams, quizzes, or assignments may be shared with anyone outside of this class. Class notes, online material, online homework problems, exams, quizzes, worksheets, handouts, or subsets thereof may NOT be posted on Facebook, Twitter, Yahoo! Answers, YouTube, blogs, wikis, forums, videos, podcasts, or any other social media.

Plagiarism: As commonly defined, plagiarism consists of passing off as one's own the ideas, words, writings, etc., which belong to another. In accordance with this definition, you are committing plagiarism if you copy the work of another person and turn it in as your own, even if you should have the permission of that person. Plagiarism is one of the worst academic sins, for the plagiarist destroys the trust among colleagues without which research cannot be safely communicated. Class notes, online material, online homework problems, exams, quizzes, worksheets, handouts, or subsets
thereof may NOT be posted on Facebook, Twitter, Yahoo!Answers, YouTube, blogs, wikis, forums, videos, podcasts, or any other social media.

**Academic Integrity Statement:** Aggie Honor Code: “An Aggie does not lie, cheat, or steal or tolerate those who do.” You are an Aggie and so am I! Upon accepting admission to Texas A&M University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning, and to follow the philosophy and rules of the Honor System. Students will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules does not exclude any member of the TAMU community from the requirements or the processes of the Honor System. For additional information please visit [http://aggiehonor.tamu.edu/](http://aggiehonor.tamu.edu/). Students may work together on their suggested practice homework problems. Online homework, individual quizzes, and examinations are to be taken individually. You may not discuss the contents of an exam until they are returned, to do so violates the Aggie Honor Code. The final exam contents are confidential forever since the final exam is property of the mathematics department and will not be returned.

**Aggie Honor Code Violations (cheating):** All Aggie Honor Code and copyright violations will be reported. Violations include copying someone else’s work, acquiring answers from an unauthorized source, allowing someone to copy your work, continue writing on an exam or quiz after time is called, violating copyright laws, having someone else do your assignments, posting class material on any social media, etc. Common sanctions include getting a zero for the assignment, getting an F for the course, not being allowed to drop the course, getting a star by your grade on your transcript indicating academic dishonesty, not graduating with honors, getting expelled, dismissed, or suspended from the university, and/or completing an Honor Council Academic Integrity Development Program course, etc.

**Disabilities:** The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, in Cain Hall, Room B118, or call 845-1637. For additional information visit [http://disability.tamu.edu](http://disability.tamu.edu).

**Personal Requests:** You are always welcome to come to my office hours; you do not need an appointment. I encourage you to come, ask questions, as often as you would like. Students who come to office hours can get personal attention and help. If you smoke, please ‘air out” before visiting. As a courtesy to all, please turn your cell phones and pagers off during all classes and office hours. Thanks!

**Please Note:** While it is critical that you attain the correct answer to a question, you must show correctly, precisely, and accurately its solution (all the steps, labels, explanations, equal signs, models, etc.) in an orderly, clear, concise manner. Where appropriate, circle your final answer. You are responsible for your own learning.

**Emergencies:** On-campus phones: 9-911

Off-campus and cell phones: 911
Tentative Schedule

Week 1: Introduction, Sections 1A – 1C: real numbers, exponents, radicals, polynomials  
Week 2: Sections 1C – 2A: polynomials, rational expressions, complex numbers, solving equations  
Week 3: Sections 2A – 2B: solving equations, solving inequalities  
Week 4: Review, EXAM 1 (1A – 2B), Sections: 3A rectangular coordinate system  
Week 5: Sections 3A – 4A: graphs of equations, linear equations and inequalities in two variables, functions  
Week 6: Sections 4B – 4E: graphs of functions, transformations of functions, extreme function values, combinations of functions  
Week 7: Sections 4E – 5A: combinations of functions, inverse functions, polynomial functions  
Week 8: Review, EXAM 2 (3A – 5A), Sections 5B: rational functions  
Week 9: Sections 5B – 5D: rational functions, exponential functions, logarithmic functions  
Week 10: Sections 5D – 7B: logarithmic functions, exponential and logarithmic equations, applications of exponentials and logarithms, systems of linear and non-linear equations  
Week 11: Sections 8A – 8D: angles and circles, trigonometric functions and their graphs, trigonometric identities  
Week 12: Review, EXAM 3 (5B – 8D), Sections: 8E – 8F inverse sine functions, inverse trigonometric functions  
Week 13: Sections 8G – 8H: law of sines and cosines, solving trigonometric equation  
Week 14: Sections 8H – 9D: solving trigonometric equations, vectors, scalar multiplication, vector addition, vector length  
Week 15: 9D – 9E: vector length, dot product; Review

Help:

- Bookmark my web page so you will know where to find all important information  
  http://www.math.tamu.edu/~Sherry.Scarborough/
- Bookmark my Math 150 web page  
  http://www.math.tamu.edu/~sherry.scarborough/150topics.html
- Read the first day handout and the welcome note found on my Math 150 web page  
- Read my class notes (found on elearning.tamu.edu) and skim the online book before class  
- Attend all classes, including all recitations  
- Bring your class notes, calculator, pencil, and TAMU student ID to every class  
- Do all your graded online homework  
- Ask questions  
- Do all your text homework  
- Attend Dr. Sherry's office hours  
- Attend help sessions http://www.math.tamu.edu/teaching/wordpress/stuinfo/index.php  
- Attend Week-In-Review (WIR) and do the problems before going to WIR or looking at the solutions,  
  http://www.math.tamu.edu/~scarboro/150fall2013wir.html
- Do past WIR problems http://www.math.tamu.edu/~sherry.scarborough/150topics.html  
- Watch the special topic streaming videos found on my Math 150 web page  
- Ask me for help with homework problems during office hours  
- Read "Success at Math" at http://www.math.tamu.edu/~jmlinhart/success.html  
- Keep up with the course  
- Form study groups and get together regularly  
- Get a personal tutor (a list is available outside Blocker 602)  
- Contact the Learning Skills Center (845-4427)  
- Contact tutoring@aggieculture.tamu.edu  
- Contact Services for Students with Disabilities, if needed, at 845-1637  
- Read How is College Different from High School? by TAMU Student Counseling Service at  
  http://www.math.tamu.edu/~scarboro/howiscollegedifferentfromhighschool.pdf
- Read Self Help-Math Study Skills by TAMU Student Counseling Service at http://ses.tamu.edu/?q=node/92
- See TAMU Student Counseling Service Self Help Guides at http://ses.tamu.edu/?q=node/88#academic  
- Register for TAMU Student Counseling Services at http://ses.tamu.edu/
Math 150 Learning Outcomes Outline

A. Basic Algebraic Concepts
   1. Real Numbers
   2. Exponents and Radicals
   3. Polynomials
   4. Rational Expressions
   5. Complex Numbers

B. Equations and Inequalities
   1. Solving Equations
   2. Solving Inequalities

C. Graphing
   1. Rectangular (Cartesian) Coordinate Systems
   2. Graphs of Equations
   3. Linear Equations and Inequalities in Two Variables

D. Functions
   1. Introduction to Functions
   2. Graphs of Functions
   3. Transformation of Functions
   4. Maximum and Minimum Functions Values
   5. Combinations of Functions
   6. Inverse Functions

E. Special Type of Functions
   1. Polynomial Functions
   2. Rational Functions
   3. Exponential Functions
   4. Logarithmic Functions

F. Exponentials and Logarithms
   1. Exponential and Logarithmic Equations
   2. Applications of Exponentials and Logarithms

G. Systems of Equations
   1. Systems of Linear Equations
   2. Systems of Non-Linear Equations

H. Trigonometry
   1. Angles and Circles
   2. Trigonometric Functions
   3. Graphs of Trigonometric Functions
   4. Trigonometric Identities
   5. Inverse Sine Functions
   6. Inverse Trigonometric Functions
   7. Law of Sines and Cosines
   8. Solving Trigonometric Equations

I. Vectors
   1. Definition of Vectors
   2. Scalar Multiplication
   3. Vector Addition
   4. Length
   5. Dot Product
Texas A&M University
Core Curriculum Cover Sheet
Initial Request for a course to be considered for the Fall 2014 Core Curriculum

1. This request is submitted by (department name): Mathematics

2. Course prefix and number: Math 151

3. Texas Common Course Number: 2413, 2513


5. Semester credit hours: 4

6. This request is for consideration in the following Foundational Component Area:
   □ Communication
   X Mathematics
   □ Life and Physical Sciences
   □ Language, Philosophy and Culture
   □ Creative Arts
   □ American History
   □ Government/Political Science
   □ Social and Behavioral Sciences
   Current Core: X

7. This course should also be considered for International and Cultural Diversity (ICD) designation:
   □ Yes
   X No

8. How frequently will the class be offered? Fall, Spring & Summer

9. Number of class sections per semester:
   Fall average = 57
   Spring average = 26
   Summer average = 3

10. Number of students per semester:
    Fall average = 1715
    Spring average = 758
    Summer average = 52
    2011-2012 2010-2011 2009-2010
    2545 2463 2566

11. Historic annual enrollment for the last three years:

12. This completed form must be attached to a course syllabus that sufficiently and specifically details the appropriate core objectives through multiple lectures, outside activities, assignments, etc. Representitive from department submitting request should be in attendance when considered by the Core Curriculum Council.

13. Submitted by:

   Course Instructor
   Benjamin Aurispa
   Approvals:
   Date: 3/27/13

14. Department Head
    Date: 3/29/13

15. College Dean/Designee
    Date: 4/1/13

For additional information regarding core curriculum, visit the Texas Higher Education Coordinating Board website at www.thecb.state.tx.us/corecurriculum2014

See form instructions for submission/approval process.
Texas A&M University

Core Curriculum

Initial Request for a Course Addition to the Fall 2014 Core Curriculum

Foundational Component Area: Mathematics

In the box below, describe how this course meets the Foundational Component Area description for Mathematics. Courses in this category focus on quantitative literacy in logic, patterns, and relationships. Courses involve the understanding of key mathematical concepts, and the application of appropriate quantitative tools to everyday experience.

The proposed course must contain all elements of the Foundational Component Area. How does the proposed course specifically address the Foundational Component Area definition above?

This course focuses on quantitative literacy in mathematics along with real world applications to physics, related rate problems, and optimization. Upon successful completion of this course, students will be able to:

- Understand vectors and vector functions, both graphically and quantitatively, and apply them to real world situations involving velocity, forces, and work.
- Construct vector and parametric equations of lines and understand vector functions and their relationship to parametric equations.
- Understand the concept of a limit graphically, numerically, and algebraically, and apply the relationship between limits, continuity, and differentiability in determining where a function is continuous and/or differentiable.
- Define the limit definition of the derivative and calculate derivatives using the limit definition, differentiation formulas, the chain rule, and implicit differentiation, with applications to tangent line and velocity problems.
- Calculate limits and derivatives of vector functions with applications to physics such as computing velocity and acceleration vectors.
- Identify exponential, logarithmic, and inverse trigonometric functions, and compute limits and derivatives involving these classes of functions.
- Apply the derivative to mathematically model velocity and acceleration as well as real world related rate applications, such as calculating the rate at which the distance between two moving objects is changing or the rate at which the volume of a cone being filled with water is changing.
- Approximate functions and function values using the derivative and the tangent line.
- Identify and understand indeterminate forms and apply the derivative to calculate limits using L'Hospital's Rule.
- Understand and apply the Intermediate Value Theorem and the Mean Value Theorem, and be able to logically determine when these theorems can be used.
- Use calculus and logic to sketch graphs of functions and analyze their properties, including where a function is increasing/decreasing and in describing the concavity of the function.
- Determine the maximum/minimum values of functions, including applied optimization problems.
- Compute antiderivatives and understand the concept of integration as it relates to area and Riemann sums.
- Articulate the relationship between derivatives and integrals using the Fundamental Theorem of Calculus, and evaluate definite integrals using the Fundamental Theorem of Calculus.
- Use a Computer Algebra System to solve problems.

Core Objectives

Describe how the proposed course develops the required core objectives below by indicating how each learning objective will be addressed, what specific strategies will be used for each objective and how student learning of each objective will be evaluated.

The proposed course is required to contain each element of the Core Objective.
Texas A&M University
Core Curriculum
Initial Request for a Course Addition to the Fall 2014 Core Curriculum

Critical Thinking (to include creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information):

The following critical thinking skills will be assessed on quizzes, homework, and exams.
- Students will think critically about limits in determining how the limit conceptually relates to the behavior of the function.
- Students will think critically about continuity and differentiability to justify whether a function is continuous and/or differentiable at a point.
- Students will evaluate the proper technique to use when computing limits and derivatives of functions.
- Students will synthesize data determined from the first and second derivatives to determine the properties and shape of a function.
- Students will use inquiry to determine on what intervals a function is increasing/decreasing and to determine the intervals of concavity of the function by analyzing the signs of the first and second derivatives.
- Students will innovatively think about how to solve related rate word problems and optimization problems.
- Students will analyze functions using continuity and the derivative in determining the maximum and minimum values of the function, and if they exist.
- Students will develop a critical understanding of the relationship between the derivative and the integral using the Fundamental Theorem of Calculus.

Communication (to include effective development, interpretation and expression of ideas through written, oral and visual communication):

The following communication skills will be assessed in class, on quizzes, homework, and exams.
- Students will recognize and construct graphs of basic functions, including polynomials, exponential functions, logarithmic functions, and trigonometric functions.
- Students will justify solutions to optimization problems in writing.
- Students will interpret information from the derivatives of a function in order to develop a visual sketch of the graph of the function and to communicate in writing the properties of the function.
- Students will identify points of discontinuity and non-differentiability by examining the graphs of functions.
- Students will express mathematical concepts, such as the definition of the derivative, both abstractly with equations and in writing solutions to problems.
- Students will develop solutions to problems that involve the use of theorems, such as the Squeeze Theorem, the Intermediate Value Theorem, and the Mean Value Theorem.
- Students will use graphs of functions to determine the value of definite integrals as they relate to area.
- Students will be required to communicate orally with other group members when working on Computer Algebra System projects or other group activities.
- Students will communicate orally in group discussion in the required weekly recitation sessions.

Empirical and Quantitative Skills (to include the manipulation and analysis of numerical data or observable facts resulting in informed conclusions):

The following empirical and quantitative skills will be assessed on quizzes, homework, and exams.
- Students will analyze limits numerically to determine the sign of the infinite limit.
- Students will analyze numerical data in determining the signs of the first and second derivative in order to make conclusions or the shape of the graph.
- Students will compute derivatives and interpret the results as they relate to tangent line, velocity, and other rate of change problems.
- Students will numerically approximate the values of a function by using the tangent line approximation.
- Students will calculate antiderivatives of functions and use initial data to determine any unknown constants.
- Students will make conclusions involving maximum and minimum values of functions (both local and
Texas A&M University

Core Curriculum

Initial Request for a Course Addition to the Fall 2014 Core Curriculum

Students will manipulate given information to develop a function to be used in optimization problems and then apply calculus to find and interpret the optimal solution.

Students will approximate the value of a definite integral numerically using Riemann sums.

Students will compute definite integrals and interpret the results as they relate to area under a curve.

Students will manipulate given information to create a related rate model involving known quantities, and then apply calculus to solve for an unknown rate of change.

Please be aware that instructors should be prepared to submit samples/examples of student work as part of the future course recertification process.
**Catalog Description:** Math 151: Engineering Mathematics I. Rectangular coordinates, vectors, analytic geometry, functions, limits, derivatives of functions, applications, integration, computer algebra (MATLAB). MATH 171 designed to be a more demanding version of this course. Prerequisite: MATH 150 or equivalent or acceptable score on TAMU Math Placement Exam. Credit will not be given for more than one of MATH 131, MATH 142, MATH 147, MATH 151 and MATH 171.

**Learning Outcomes**

This course focuses on quantitative literacy in mathematics along with real world applications to physics, related rate problems, and optimization. Upon successful completion of this course, students will be able to:

- Understand vectors and vector functions, both graphically and quantitatively, and apply them to real world situations involving velocity, forces, and work.
- Construct vector and parametric equations of lines and understand vector functions and their relationship to parametric equations.
- Understand the concept of a limit graphically, numerically, and algebraically, and apply the relationship between limits, continuity, and differentiability in determining where a function is continuous and/or differentiable.
- Define the limit definition of the derivative and calculate derivatives using the limit definition, differentiation formulas, the chain rule, and implicit differentiation, with applications to tangent line and velocity problems.
- Calculate limits and derivatives of vector functions with applications to physics such as computing velocity and acceleration vectors.
- Identify exponential, logarithmic, and inverse trigonometric functions, and compute limits and derivatives involving these classes of functions.
- Apply the derivative to mathematically model velocity and acceleration as well as real world related rate applications, such as calculating the rate at which the distance between two moving objects is changing or the rate at which the volume of a cone being filled with water is changing.
- Approximate functions and function values using the derivative and the tangent line.
- Identify and understand indeterminate forms and apply the derivative to calculate limits using L’Hospital’s Rule.
- Understand and apply the Intermediate Value Theorem and the Mean Value Theorem, and be able to logically determine when these theorems can be used.
- Use calculus and logic to sketch graphs of functions and analyze their properties, including where a function is increasing/decreasing and in describing the concavity of the function.
- Determine the maximum/minimum values of functions, including applied optimization problems.
- Compute antiderivatives and understand the concept of integration as it relates to area and Riemann sums.
- Articulate the relationship between derivatives and integrals using the Fundamental Theorem of Calculus, and evaluate definite integrals using the Fundamental Theorem of Calculus.
- Use a Computer Algebra System to solve problems.

**Core Objectives**

**Critical Thinking**

- Students will think critically about limits in determining how the limit conceptually relates to the behavior of the function.
- Students will think critically about continuity and differentiability to justify whether a function is continuous and/or differentiable at a point.
- Students will evaluate the proper technique to use when computing limits and derivatives of functions.
- Students will synthesize data determined from the first and second derivatives to determine the properties and shape of a function.
- Students will use inquiry to determine on what intervals a function is increasing/decreasing and to determine the intervals of concavity of the function by analyzing the signs of the first and second derivatives.
- Students will innovatively think about how to solve related rate word problems and optimization problems.
- Students will analyze functions using continuity and the derivative in determining the maximum and minimum values of the function, and if they exist.
- Students will develop a critical understanding of the relationship between the derivative and the integral using the Fundamental Theorem of Calculus.
Communication Skills

- Students will recognize and construct graphs of basic functions, including polynomials, exponential functions, logarithmic functions, and trigonometric functions.
- Students will justify solutions to optimization problems in writing.
- Students will interpret information from the derivatives of a function in order to develop a visual sketch of the graph of the function and to communicate in writing the properties of the function.
- Students will identify points of discontinuity and non-differentiability by examining the graphs of functions.
- Students will express mathematical concepts, such as the definition of the derivative, both abstractly with equations and in writing solutions to problems.
- Students will develop solutions to problems that involve the use of theorems, such as the Squeeze Theorem, the Intermediate Value Theorem, and the Mean Value Theorem.
- Students will use graphs of functions to determine the value of definite integrals as they relate to area.
- Students will be required to communicate orally with other group members when working on Computer Algebra System projects or other group activities.
- Students will communicate orally in group discussion in the required weekly recitation sessions.

Empirical and Quantitative Skills

- Students will analyze limits numerically to determine the sign of the infinite limit.
- Students will analyze numerical data in determining the signs of the first and second derivative in order to make conclusions on the shape of the graph.
- Students will compute derivatives and interpret the results as they relate to tangent line, velocity, and other rate of change problems.
- Students will numerically approximate the values of a function by using the tangent line approximation.
- Students will calculate antiderivatives of functions and use initial data to determine any unknown constants.
- Students will make conclusions involving maximum and minimum values of functions (both local and absolute) based on information from the derivative.
- Students will manipulate given information to develop a function to be used in optimization problems and then apply calculus to find and interpret the optimal solution.
- Students will approximate the value of a definite integral numerically using Riemann sums.
- Students will compute definite integrals and interpret the results as they relate to area under a curve.
- Students will manipulate given information to create a related rate model involving known quantities, and then apply calculus to solve for an unknown rate of change.
Math 151  
Fall 2013  
Sections TBA, Class Time: TBA, Location: TBA

**Instructor Information:**  
**Instructor:** Benjamin Aurispa  
**Office:** Blocker 630D  
**Math Dept. Phone:** (979) 862-4192  
**Office Hours:** TBA, Also by appointment  
**E-mail:** baurispa@math.tamu.edu. Please include your name and section number in any email you send me.  
Check your TAMU email account daily, because this is where class emails will be sent. You are responsible for any announcements made through email.  
**Webpage:** www.math.tamu.edu/~baurispa -- Check regularly for announcements and important information, as well as for lecture notes, a course schedule, and other helpful links.

**Required Materials:**  
**Textbook:** Stewart, Calculus: Early Vectors, Cengage Learning. You paid for an electronic version of this textbook (eBook) through the online system WebAssign when you paid your course fees. Information on how to access your eBook can be found under the “Student Information Page” at http://www.math.tamu.edu/courses/eHomework. You are welcome to purchase a physical copy of the textbook or a loose-leaf copy of the text if you prefer, but this is not required.

**Lab Manual:** Gilat-Amos, MATLAB: An Introduction with Applications, 4th edition, Wiley

**Calculator Policy:** Calculators are not allowed on exams or quizzes, although they may be used on homework assignments.

**Course Policies:**

**Grading:**

<table>
<thead>
<tr>
<th></th>
<th>Weight</th>
<th></th>
<th>Final Grade Ranges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework:</td>
<td>5%</td>
<td></td>
<td>90% ≤ A ≤ 100%</td>
</tr>
<tr>
<td>Quizzes:</td>
<td>10%</td>
<td></td>
<td>80% ≤ B &lt; 90%</td>
</tr>
<tr>
<td>Lab Assignments:</td>
<td>10%</td>
<td></td>
<td>70% ≤ C &lt; 80%</td>
</tr>
<tr>
<td>Average of 3 Common Exams</td>
<td>50%</td>
<td></td>
<td>60% ≤ D &lt; 70%</td>
</tr>
<tr>
<td>Final Exam:</td>
<td>25%</td>
<td></td>
<td>0% ≤ F ≤ 60%</td>
</tr>
</tbody>
</table>

Due to FERPA privacy issues, I cannot discuss grades over email or phone. If you have a question about your grade, please come see me in person.

**Common Exams:** There will be 3 common exams during the semester. These exams are evening exams taken by all Math 151 students at the same time. Bring your Texas A&M student ID and a pencil to all exams. The location of the common exams will be determined at a later date. The dates for the exams and the tentative content are as follows:

- **Common Exam 1:** TBA, 7:30-9:30pm (App. D, 1.1-1.3, 2.2-2.3, 2.5-2.7, 3.1-3.2)
- **Common Exam 2:** TBA, 7:30-9:30pm (3.3-3.11, 4.1-4.2)
- **Common Exam 3:** TBA, 7:30-9:30pm (4.3-4.6, 4.8, 4.1-5.3, 5.5, 5.7, 6.1-6.3)

**Final Exam:** The final exam will be a cumulative (comprehensive) exam. The day and time of the final exam are determined by the university. The final will be on TBA.

**Graded Homework:** Graded homework assignments will be primarily done online, but may include the occasional written assignment. Online homework will be done in WebAssign. Access to WebAssign was included in your course fees. Other important information such as how to log in, how to access and take assignments, and the Student Help Request Form can be found at http://www.math.tamu.edu/courses/eHomework. I suggest you bookmark this page and visit it before you log in to WebAssign each time. Technical Note: In order for some features of WebAssign to work properly, you should use Mozilla Firefox and have the most updated versions of Flash and Java on your computer.

**Suggested Homework:** Math cannot be learned by watching someone else do math. It requires a lot of practice. On my webpage, there is a list of suggested homework. I STRONGLY suggest that you do these problems for more practice in addition to the online homework. They will not be collected, but doing them to help you learn the material is very important.

**Recitation/Lab:** Your section will meet twice weekly with your TA for recitation/lab. On Mondays, you will be in recitation. During recitation sessions, your TA will answer questions, review material, and give weekly quizzes for a grade. On Wednesdays, you will be in lab where you will complete MATLAB assignments and work with Maplets. You must attend the recitation and lab you are registered for. The times/rooms for each section are listed below.

TBA
Quizzes: There will be quizzes given weekly on Mondays (unless otherwise stated) during recitation by your TA. The best way to prepare for these quizzes is to practice problems by doing the suggested homework and the online homework. There may also be quizzes given periodically during class, either announced or unannounced, as well as take-home quizzes.

Lab: On Wednesdays, you will meet in the computer lab to work on computer assignments using MATLAB and Maple. Assignments are posted on the web and are due at the BEGINNING of lab on the designated day. MATLAB assignments will be done in groups and each group will turn in one lab. Labs turned in between 10 minutes after the start of lab and the end of the day will receive a 15% penalty. After this, no late work will be accepted.

Make-up Policy: Make-up exams and quizzes or late homework will NOT be allowed unless a University approved reason is given to me in writing. Notification before the absence is required when possible. Otherwise, you must notify me within 2 working days of the missed exam, quiz, or assignment to arrange a makeup. See University Student Rules for more guidelines. In all cases where an exam/quiz/assignment is missed due to an injury or illness, whether it be more or less than 3 days, I require a doctor's note. Further, an absence due to a non acute medical service or appointment (such as a regular checkup) is not an excused absence. Providing a fake or falsified doctor's note is considered academic dishonesty, will be reported to the Aggie Honor Council, and will result in an F* in the course.

Grade Appeals: If you believe an error has been made in grading, you have until the next class period after the exam, quiz, or assignment has been handed back to let me know. Otherwise, you must accept the grade you received.

Help Session and Week in Review: Help sessions are come-and-go times where you can ask questions and get help with your homework from the student Help Session leaders. Help Sessions meet throughout the week. There are also Calclab Help Sessions held throughout the week. For days, times, and locations, see the links on my webpage. The Week in Review is a weekly session led by an instructor to review the topics of the previous week and to provide additional examples. On exam weeks, the Week in Review will be an Exam Review. This semester I will be doing the Week in Review. See the Week in Review link on my webpage for day/time/location as well as the problem sets I will be working.

Other Sources of Help: There are streaming videos online with extra problems that you can take advantage of. There are also many past common exams and old Week in Review problem sets that you can additionally use to practice the material.

Classroom Respect: Please refrain from using electronic devices other than your calculator during class. Texting and playing on your phone or computer distracts not only you, but also those around you. If you would like to use a laptop during class to take notes with, please ask for permission prior to doing so.

Copyright: All printed handouts and web-materials are protected by US Copyright Laws. No multiple copies can be made without written permission by the instructor.

ADA Policy: The American with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, in Cain Hall, Room B118, or call 845-1637. For additional information visit http://disability.tamu.edu.

Academic Integrity Statement: Cheating and other forms of academic dishonesty will not be tolerated. Please do not compromise your integrity for the sake of temporary benefits.

Aggie Honor Code: "An Aggie does not lie, cheat, or steal, or tolerate those who do."

Upon accepting admission to Texas A&M University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning, and to follow the philosophy and rules of the Honor System. Students will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules does not excuse any member of the TAMU community from the requirements or the processes of the Honor System. For more information on academic integrity, see the Honor Council Rules and Procedures at http://www.tamu.edu/aggiehonor.

Note: As with any math class, it is very important that you keep up with the suggested homework and that you do not fall behind. Please do not hesitate to ask questions in class, to come to my office hours, or to send me an e-mail. My goal is not to cram information into your head, but to help you learn. If you are not understanding the concepts, please ask for help. Don’t wait until the day before an exam to try and grasp the material. There are Week in Reviews and Help Sessions regularly, as well as streaming videos and other materials online. Please take advantage of these resources.
Tentative Weekly Schedule: (A more detailed Daily Schedule can be found on my webpage.)

Week 1: Appendix D (Review of Trigonometry), 1.1 (Vectors)

Week 2: 1.2 (The Dot Product), 1.3 (Vector Functions), 2.2 (The Limit of a Function)

Week 3: 2.3 (Calculating Limits), 2.5 (Continuity), 2.6 (Limits at Infinity; Horizontal Asymptotes)

Week 4: 2.7 (Tangents, Velocities, and Other Rates of Change), 3.1 (Derivatives), 3.2 (Differentiation Formulas)

Week 5: 3.3 (Rates of Change in the Natural & Social Sciences), 3.4 (Derivatives of Trig Functions), Exam 1 (through 3.2)

Week 6: 3.5 (The Chain Rule), 3.6 (Implicit Differentiation), 3.7 (Derivatives of Vector Functions)

Week 7: 3.8 (Higher Derivatives), 3.9 (Slopes and Tangents to Parametric Curves), 3.10 (Related Rates)

Week 8: 3.11 (Differentials: Linear and Quadratic Approximations), 4.1 (Exponential Functions and their Derivatives), 4.2 (Inverse Functions)

Week 9: 4.3 (Logarithmic Functions), 4.4 (Derivatives of Logarithmic Functions), Exam 2 (through 4.2)

Week 10: 4.5 (Exponential Growth and Decay), 4.6 (Inverse Trig Functions), 4.8 (L'Hospital's Rule)

Week 11: 5.1 (What does $f'$ say about $f$), 5.2 (Max/Min Values), 5.3 (Derivatives and the Shapes of Curves)

Week 12: 5.5 (Applied Max/Min Word Problems), 5.7 (Antiderivatives), 6.1 (Sigma Notation)

Week 13: 6.2 (Area), 6.3 (The Definite Integral)

Week 14: Exam 3 (through 6.3), 6.4 (The Fundamental Theorem of Calculus)

Week 15: 6.4, Review

Finals
Texas A&M University
Core Curriculum Cover Sheet
Initial Request for a course to be considered for the Fall 2014 Core Curriculum

1. This request is submitted by (department name): Mathematics

2. Course prefix and number: Math 166

3. Texas Common Course Number: Click here to enter text.

4. Complete course title: Topics in Contemporary Mathematics II

5. Semester credit hours: 3

6. This request is for consideration in the following Foundational Component Area:
   - Communication
   - Creative Arts
   - Mathematics
   - American History
   - Life and Physical Sciences
   - Government/Political Science
   - Language, Philosophy and Culture
   - Social and Behavioral Sciences
   - Current Core - Yes

7. This course should also be considered for International and Cultural Diversity (ICD) designation:
   - Yes
   - No

8. How frequently will the class be offered? Fall, Spring & Summer

9. Number of class sections per semester:
   - Fall average= 6
   - Spring average= 5
   - Summer= 1

10. Number of students per semester:
    - Fall average= 413
    - Spring average= 343
    - Summer= 22
    - 2011-2012
    - 2010-2011
    - 2009-2013

11. Historic annual enrollment for the last three years:
    - 767
    - 777
    - 789

This completed form must be attached to a course syllabus that sufficiently and specifically details the appropriate core objectives through multiple lectures, outside activities, assignments, etc. Representative from department submitting request should be in attendance when considered by the Core Curriculum Council.

12. Submitted by: [Signature]
    Date: 3/29/2013

13. Approvals: [Signature]
    Date: 3/29/13

14. Department Head: [Signature]
    Date: 4/1/13

15. College Dean/Designee: [Signature]

For additional information regarding core curriculum, visit the Texas Higher Education Coordinating Board website at www.thecb.state.tx.us/corecurriculum2014

See form instructions for submission/approval process.
Texas A&M University
Core Curriculum
Initial Request for a Course Addition to the Fall 2014 Core Curriculum

Foundational Component Area: Mathematics

In the box below, describe how this course meets the Foundational Component Area description for Mathematics. Courses in this category focus on quantitative literacy in logic, patterns, and relationships. Courses involve the understanding of key mathematical concepts, and the application of appropriate quantitative tools to everyday experience.

The proposed course must contain all elements of the Foundational Component Area. How does the proposed course specifically address the Foundational Component Area definition above?

This course is focused on quantitative literacy in mathematics found in everyday life. Upon successful completion of this course, students will be able to:

• Understand and apply the rules of logic and sets.
• Recognize patterns in order to understand the principles of probability and counting and apply these concepts to a variety of problems; for instance, finding the probability of drawing a particular hand from a deck of cards.
• Identify types of random variables and be able to calculate probabilities and statistics for these random variables.
• Apply the concepts of finance to everyday experiences, such as paying off mortgages and saving for retirement.
• Understand matrices and their relationships to applications including solving systems of linear equations and solving problems involving Markov processes and game theory.

Core Objectives

Describe how the proposed course develops the required core objectives below by indicating how each learning objective will be addressed, what specific strategies will be used for each objective and how student learning of each objective will be evaluated.

The proposed course is required to contain each element of the Core Objective.

Critical Thinking (to include creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information):

The following critical thinking skills will be assessed on in-class quizzes and exams.

• Students will create a truth table for (nontrivial) compound statements.
• Students will analyze the given information about sets to find the number of elements in particular subsets.
• Students will synthesize information to determine whether or not events are independent.
• Students will evaluate probabilities involving Venn diagrams, tree diagrams, and independent events.
• Students will differentiate between basic and conditional probability including knowing when Bayes' theorem is appropriate.
• Students will carefully examine and interpret statements to determine the equivalent mathematical notation or equation.
• Students will understand the difference between odds and the probability of an event and be able to determine one from the other.
• Students will innovatively use counting techniques (multiplication principle, permutations, combinations) to determine the number of ways a task can be completed and to find the probability that the task occurs.
Texas A&M University

Core Curriculum

Initial Request for a Course Addition to the Fall 2014 Core Curriculum

- Students will use inquiry to resolve whether or not an experiment is binomial.
- Students will classify random variables as finite discrete, infinite discrete, or continuous and give all the possible values it may assume.
- Students will calculate probabilities of binomial and normal random variables.
- Students will understand the difference between simple and compound interest and when to use each.
- Students will think creatively in order to set up a system of equations and solve a word problem.
- Students will understand what an inverse matrix is and its relationship with an identity matrix.
- Students will synthesize data from a word problem to set up a transition matrix of a Markov process.

Communication (to include effective development, interpretation and expression of ideas through written, oral and visual communication):

The following communication skills will be assessed on in-class quizzes, exams and in lecture.

- Students will develop an understanding of the relationship between mathematical symbols of logic and their English language counterpart.
- Students will effectively communicate information about sets and experiments using written symbolic notation.
- Students will visually display experiments and associated probabilities using tree diagrams.
- Students will express mathematical concepts both abstractly with equations and in writing.
- Students will communicate statistics through probability distributions and graphically through histograms.
- Students will explain why a matrix operation is possible or not and interpret the meaning of the entries of the resulting matrix when the operation makes sense.
- Students will answer questions during lecture concerning topics discussed in class.

Empirical and Quantitative Skills (to include the manipulation and analysis of numerical data or observable facts resulting in informed conclusions):

The following empirical and quantitative skills will be assessed on in-class quizzes and exams.

- Students will describe numerical data sets by finding relevant statistics, such as expected value, median, mode, standard deviation and variance.
- Students will use statistics to make informed conclusions about real-world problems including determining the premium for an insurance policy.
- Students will analyze financial information to make decisions regarding everyday applications, such as loan payments, annuities, amortizations, and sinking funds.
- Students will use effective interest rates to select the best loan or savings option.
- Students will create empirical probability distributions based on a given set of data.

Please be aware that instructors should be prepared to submit samples/examples of student work as part of the future course recertification process.
Math 166 - Topics in Contemporary Mathematics II

Catalog Description: Math 166: Topics in Contemporary Mathematics II (Credit 3) Finite mathematics, matrices, probability and applications. Prerequisites: High school algebra I and II and geometry. Credit will not be given to more than one of Math 141 and 166.

Learning Objectives
This course is focused on quantitative literacy in mathematics found in everyday life. Upon successful completion of this course, students will be able to:

- Understand and apply the rules of logic and sets.
- Recognize patterns in order to understand the principles of probability and counting and apply these concepts to a variety of problems; for instance, finding the probability of drawing a particular hand from a deck of cards.
- Identify types of random variables and be able to calculate probabilities and statistics for these random variables.
- Apply the concepts of finance to everyday experiences, such as paying off mortgages and saving for retirement.
- Understand matrices and their relationships to applications including solving systems of linear equations and solving problems involving Markov processes and game theory.

Core Objectives

Critical Thinking
The following critical thinking skills will be assessed on in-class quizzes and exams.

- Students will create a truth table for (nontrivial) compound statements.
- Students will analyze the given information about sets to find the number of elements in particular subsets.
- Students will synthesize information to determine whether or not events are independent.
- Students will evaluate probabilities involving Venn diagrams, tree diagrams, and independent events.
- Students will differentiate between basic and conditional probability including knowing when Bayes’ theorem is appropriate.
- Students will carefully examine and interpret statements to determine the equivalent mathematical notation or equation.
- Students will understand the difference between odds and the probability of an event and be able to determine one from the other.
- Students will innovatively use counting techniques (multiplication principle, permutations, combinations) to determine the number of ways a task can be completed and to find the probability that the task occurs.
- Students will use inquiry to resolve whether or not an experiment is binomial.
- Students will classify random variables as finite discrete, infinite discrete, or continuous and give all the possible values it may assume.
- Students will calculate probabilities of binomial and normal random variables.
- Students will understand the difference between simple and compound interest and when to use each.
- Students will think creatively in order to set up a system of equations and solve a word problem.
- Students will understand what an inverse matrix is and its relationship with an identity matrix.
- Students will synthesize data from a word problem to set up a transition matrix of a Markov process.

Communication Skills
The following communication skills will be assessed on in-class quizzes, exams and in lecture.

- Students will develop an understanding of the relationship between mathematical symbols of logic and their English language counterpart.
- Students will effectively communicate information about sets and experiments using written symbolic notation.
- Students will visually display experiments and associated probabilities using tree diagrams.
- Students will express mathematical concepts both abstractly with equations and in writing.
- Students will communicate statistics through probability distributions and graphically through histograms.
• Students will explain why a matrix operation is possible or not and interpret the meaning of the entries of the resulting matrix when the operation makes sense.

• Students will answer questions during lecture concerning topics discussed in class.

Empirical and Quantitative Skills
The following empirical and quantitative skills will be assessed on in-class quizzes and exams.

• Students will describe numerical data sets by finding relevant statistics, such as expected value, median, mode, standard deviation and variance.

• Students will use statistics to make informed conclusions about real-world problems including determining the premium for an insurance policy.

• Students will analyze financial information to make decisions regarding everyday applications, such as loan payments, annuities, amortizations, and sinking funds.

• Students will use effective interest rates to select the best loan or savings option.

• Students will create empirical probability distributions based on a given set of data.
Texas A&M University  
MATH 166  
Topics in Contemporary Mathematics II  
Fall 2013  
Section 504  
TR 2:20-3:35 BLOC 149  

Instructor: Jaclyn Kessler  
Office: Blocker 616  
Office Hours:  
* TBA and by appointment  
E-Mail Address: jkessler@math.tamu.edu  
(Check your neo email account every day. This will be a major line of communication between the student and the instructor. I will send urgent announcements and important information via email. You are responsible for any information sent via email. When you send an email, please include your full name, course number (166), and section number.)  

Web Page: http://www.math.tamu.edu/~jkessler  
(Check the web page regularly. I will post exam information, class announcements, important information, class notes, and daily schedule on the web page. There will also be a list of suggested homework, help session schedules, a link to the available Math 166 Week-I-Review, and a link to the departmental web page for the course.)  

Texts: Included in the course fees is access to WebAssign as well as an eBook version of the text through WebAssign. If you would like to purchase a hard copy version of the text:  


Calculator Policy: You will be required to bring to class every day either a TI-83, TI-84 (Plus or Silver Editions are fine), or TI-Nspire (non-CAS version). You may not use any calculator that is able to perform symbolic math, such as a TI-89. You will also be required to reset memory before each exam. If there are any programs that you want to keep for personal use, you will want to save them to your computer so you can reload them after the class is completed.  

Student IDs: You must bring your student ID to every class.  

Course Description and Prerequisites: CREDIT: 3. Finite mathematics, matrices, probability and applications. Prerequisites: High school algebra I and II and geometry. Credit will not be given for more than one of MATH 141 and MATH 166.  

Grading Policy:  

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
<th>Grade Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exam I</td>
<td>15%</td>
<td>A = 90% - 100%</td>
</tr>
<tr>
<td>Exam II</td>
<td>15%</td>
<td>B = 80% - 89%</td>
</tr>
<tr>
<td>Exam III</td>
<td>15%</td>
<td>C = 70% - 79%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>25%</td>
<td>D = 60% - 69%</td>
</tr>
<tr>
<td>Quizzes</td>
<td>12.5%</td>
<td>F = 0% - 59%</td>
</tr>
<tr>
<td>In-Class Assignments</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>WebAssign Homework</td>
<td>12.5%</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
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</tbody>
</table>

At the end of the semester, you will get the grade you earned, according to the distribution above. No exceptions.  

Exams: There will be three in-class exams and a comprehensive final exam. You must bring a valid form of I.D. to every exam (i.e., student ID or Driver’s License). Tentative dates for the in-class exams is as follows:  

- Exam I: September 19  
- Exam II: October 17  
- Exam III: November 13  

The final exam will be given on WEDNESDAY, DECEMBER 11, 1-3pm BLOC 149.  

Quizzes: Quizzes will be given regularly throughout the semester. They may be announced or unannounced, in-class or take home. Quizzes must be done completely on your own. You may use the resources listed in the directions of the individual quiz. You must show all of your work to obtain full credit. I will drop your lowest quiz grade at the end of the semester.
In-Class Activities: There will be about one in-class activity every week. The purpose of these is to provide you an opportunity to practice a concept soon after it is taught. There will be no make-ups for in-class activities. I will drop your lowest activity grade at the end of the semester. If you miss an activity due to a University excused absence and provide the appropriate documentation, the assignment missed will not be included in your in-class assignment grade.

WebAssign Homework: Homework will be due on Wednesday nights. Since the homework is done at your convenience, there will be no make-ups or extensions on homework. The homework assignments will not be re-opened at the end of the semester. I will drop your lowest two individual homework grades. If you have questions on the homework, please visit me during office hours or go to help sessions. (Information on Help Sessions will be posted on the Departmental Webpage.)

https://www.webassign.net/tamu/login.html

eLearning: All grades will be posted on eLearning. Grades on eLearning will be updated after every exam.

http://elearning.tamu.edu/

Attendance: I strongly encourage you to attend and participate in every lecture. You must arrive and be fully prepared for class by the class start time. You are expected to stay the entire class time, unless you notify me prior to class. If you miss class due to a University excused absence and have proper notification, you will be able to hand copy notes during my office hours. Having an exam for another class is not a University excused absence, so plan your schedule accordingly.

Make-Up Policy: No make-ups will be given without written evidence of an official University excused absence. (See University Student Rules.) According to Section 7.3 of the University Student Rules, for an absence to be considered excused, "the student must notify his or her instructor in writing (acknowledged e-mail message is acceptable) prior to the date of absence if such notification is feasible (e.g. accident or emergency) the student must provide notification by the end of the second working day after the absence. This notification should include an explanation of why notice could not be sent prior to the class. In addition (and also in accordance with University Student Rules), a written excuse must be presented upon return to class. Specifically, in the case of illness too severe or contagious to attend class or in the case of injury, students are required to obtain a confirmation note from a health care professional affirming date and time of a medical office visit regarding the illness or injury and confirming the need of the absence (with permission to verify) before a make-up will be given. The Texas A&M University Explanatory Statement for Absence will NOT be accepted. An absence for a non-acute medical service does not constitute an excused absence. Students with an official University excused absence are permitted to make up work only for the dates of the absence.

Late Work Policy: Late work will not be accepted without a University excused absence. The definition of late work is any assignment not in my possession once collected from your assigned row.

Grade Questions: You have two business days from the time any assignment is returned to resolve any grade questions. You should retain all returned work through the end of the semester to compare the grade assigned to the grade recorded in eLearning. I cannot discuss grades via email or phone.

Academic Integrity Statement:

An Aggie does not lie, cheat or steal, or tolerate those who do.

I further refer the student to the Honor Council Rules and Procedures on the web at

http://www.tamu.edu/aggiehonor

Students with Disabilities: The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, in Cain Hall, Room B118, or call 845-1637. For additional information visit

http://disability.tamu.edu

Classroom Etiquette: During class I will stay focused on teaching you mathematics, so please stay focused on learning the mathematics being taught. This means you should stay awake throughout the class, you should not be reading a newspaper or materials from another course, you should refrain from discussion not related to class and you should not leave class early unless you have cleared it with me first. If I feel you are being disruptive or disrespectful during class, you may be asked to leave. You should never have a cell phone out or turned on during class. No unapproved electronic devices are allowed in the classroom. If I hear or see your cell phone out, I may ask you to leave the classroom and you will therefore not be able to complete any in-class assignments.
Sources of Help:

- **Office Hours**: I am here to help, but I won’t know if you have a question unless you ask! I encourage you to ask questions both in and out of class, come to office hours, and talk to me. The more you participate, practice, and attempt to understand, the more successful you will be.

- **Class Notes**: An outline of notes will be posted prior to class each day. It will be helpful to print these out and bring them to class. You should review your notes after class to make sure you understand everything covered and note any questions you may need answered before the next class. I will NOT post completed notes after class. If you miss class due to a University excused absence, you may hand copy the notes during my office hours. The notes are also designed to be a primary help for homework as well as a primary review for exams.

- **Your Classmates**: Form study groups! Ask each other for assistance. Work together to understand the material.

- **Week-In-Review (WIR)**: There will be one Week-In-Review session held by me every week starting the second week of classes. Each review is open to all MATH 166 students and reviews the topics covered during the previous week of classes. The times and locations will be posted on the course’s webpage, as well as announced in class.

- **Help Sessions**: Help sessions are an opportunity for you to ask questions and get help with your homework. The help sessions are led by undergraduate students. The dates and times will be posted on the departmental webpage, as well as on my own.

- **Practice**: It is essential that you practice as many problems as you can. In addition to the quizzes, in-class activities, and WebAssign homework, there are suggested homework problems.

- **Additionally**, see **Tips for Success** on my Web Page.

**Copyright Policy**: All printed materials disseminated in class or on the web are protected by Copyright laws. One copy (or download from the web) is allowed for personal use. Multiple copies or sale of any of these materials is strictly prohibited.

**Tentative Schedule**:

- **Week 1**: L.1-L.2, 1.1
- **Week 2**: 1.1-1.4
- **Week 3**: 1.4-1.6
- **Week 4**: 1.7, Review, Exam I (L.1-L.2, 1.1-1.7)
- **Week 5**: 2.1-2.2
- **Week 6**: 2.3-2.4, 3.1
- **Week 7**: 3.1-3.3
- **Week 8**: 3.4, Review, Exam II (2.1-2.4, 3.1-3.4)
- **Week 9**: F.1-F.3
- **Week 10**: F.4, Intro to Systems, 4.3-4.4
- **Week 11**: 4.4, 5.1-5.2
- **Week 12**: 5.3, Review, Exam III (F.1-F.4, 4.3-4.4, 5.1-5.3)
- **Week 13**: M.1-M.3
- **Week 14**: G.1-G.2
- **Week 15**: Review
- **Week 16**: Final Exam (Comprehensive)
Texas A&M University
Core Curriculum Cover Sheet

Initial Request for a course to be considered for the Fall 2014 Core Curriculum

1. This request is submitted by (department name): Mathematics

2. Course prefix and number: Math 171

3. Texas Common Course Number: Click here to enter text.

4. Complete course title: Analytic Geometry and Calculus

5. Semester credit hours: 4

6. This request is for consideration in the following Foundational Component Area:
   - □ Communication
   - □ Mathematics
   - □ Life and Physical Sciences
   - □ Language, Philosophy and Culture
   - □ Creative Arts
   - □ American History
   - □ Government/Political Science
   - □ Social and Behavioral Sciences
   - This course is current core - YES

7. This course should also be considered for International and Cultural Diversity (ICD) designation:
   - □ Yes
   - □ No

8. How frequently will the course be offered? Fall, Spring

9. Number of class sections per semester: Fall average = 6, Spring average = 2

10. Number of students per semester: Fall average = 186, Spring average = 72

11. Historic annual enrollment for the last three years:

This completed form must be attached to a course syllabus that sufficiently and specifically details the appropriate core objectives through multiple lectures, outside activities, assignments, etc. Representative from department

12. submitting request should be in attendance when considered by the Core Curriculum Council.

13. Submitted by:

   - Course Instructor: Benjamin Arispa
   - Date: 3/27/13

   - Approvals: [Signature]
   - Date: 3/29/13

14. Department Head: [Signature]
   - Date: 4/1/13

15. College Dean/Designee: [Signature]
   - Date

For additional information regarding core curriculum, visit the Texas Higher Education Coordinating Board website at www.thecb.state.tx.us/corecurriculum2014

See form instructions for submission/approval process.
Texas A&M University
Core Curriculum
Initial Request for a Course Addition to the Fall 2014 Core Curriculum

Foundational Component Area: Mathematics

In the box below, describe how this course meets the Foundational Component Area description for Mathematics. Courses in this category focus on quantitative literacy in logic, patterns, and relationships. Courses involve the understanding of key mathematical concepts, and the application of appropriate quantitative tools to everyday experience.

The proposed course must contain all elements of the Foundational Component Area. How does the proposed course specifically address the Foundational Component Area definition above?

This course focuses on quantitative literacy in mathematics along with real world applications to physics, related rate problems, and optimization. Upon successful completion of this course, students will be able to:

- Understand vectors and vector functions, both graphically and quantitatively, and apply them to real world situations involving velocity, forces, and work.
- Construct vector and parametric equations of lines and understand vector functions and their relationship to parametric equations.
- Understand the concept of a limit graphically, numerically, and algebraically, and apply the relationship between limits, continuity, and differentiability in determining where a function is continuous and/or differentiable.
- Conceptually understand the precise definition of a limit involving epsilon and delta.
- Define the limit definition of the derivative and calculate derivatives using the limit definition, differentiation formulas, the chain rule, and implicit differentiation, with applications to tangent line and velocity problems.
- Calculate limits and derivatives of vector functions with applications to physics such as computing velocity and acceleration vectors.
- Identify exponential, logarithmic, and inverse trigonometric functions, and compute limits and derivatives involving these classes of functions.
- Apply the derivative to mathematically model velocity and acceleration as well as real world related rate applications, such as calculating the rate at which the distance between two moving objects is changing or the rate at which the volume of a cone being filled with water is changing.
- Approximate functions and function values using the derivative and the tangent line.
- Identify and understand indeterminate forms and apply the derivative to calculate limits using L'Hospital's Rule.
- Understand and apply the Intermediate Value Theorem and the Mean Value Theorem, and be able to logically determine when these theorems can be used.
- Use calculus and logic to sketch graphs of functions and analyze their properties, including where a function is increasing/decreasing and in describing the concavity of the function.
- Determine the maximum/minimum values of functions, including applied optimization problems.
- Compute antiderivatives and understand the concept of integration as it relates to area and Riemann sums.
- Articulate the relationship between derivatives and integrals using the Fundamental Theorem of Calculus, and evaluate definite integrals using the Fundamental Theorem of Calculus.
- Explain and/or prove various formulas or theorems used in the course.

Core Objectives

Describe how the proposed course develops the required core objectives below by indicating how each learning objective will be addressed, what specific strategies will be used for each objective and how student learning of each objective will be evaluated.
Texas A&M University

Core Curriculum

Initial Request for a Course Addition to the Fall 2014 Core Curriculum

The proposed course is required to contain each element of the Core Objective.

Critical Thinking (to include creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information):

The following critical thinking skills will be assessed on quizzes, homework, and exams.

- Students will think critically about limits in determining how the limit conceptually relates to the behavior of the function.
- Students will analyze the limit of a function at a point using the precise definition of the limit.
- Students will think critically about continuity and differentiability to justify whether a function is continuous and or differentiable at a point.
- Students will evaluate the proper technique to use when computing limits and derivatives of functions.
- Students will synthesize data determined from the first and second derivatives to determine the properties and shape of a function.
- Students will use inquiry to determine on what intervals a function is increasing/decreasing and to determine the intervals of concavity of the function by analyzing the signs of the first and second derivatives.
- Students will innovatively think about how to solve related rate word problems and optimization problems.
- Students will analyze functions using continuity and the derivative in determining the maximum and minimum values of the function, and if they exist.
- Students will develop a critical understanding of the relationship between the derivative and the integral using the Fundamental Theorem of Calculus.

Communication (to include effective development, interpretation and expression of ideas through written, oral and visual communication):

The following communication skills will be assessed in class, on quizzes, homework, and exams.

- Students will recognize and construct graphs of basic functions, including polynomials, exponential functions, logarithmic functions, and trigonometric functions.
- Students will justify solutions to optimization problems in writing.
- Students will interpret information from the derivatives of a function in order to develop a visual sketch of the graph of the function and to communicate in writing the properties of the function.
- Students will identify points of discontinuity and non-differentiability by examining the graphs of functions.
- Students will express mathematical concepts, such as the definition of the derivative, both abstractly with equations and in writing solutions to problems.
- Students will develop solutions to problems that involve the use of theorems, such as the Squeeze Theorem, the Intermediate Value Theorem, and the Mean Value Theorem.
- Students will use graphs of functions to determine the value of definite integrals as they relate to area.
- Students will be able to explain and/or prove various formulas or theorems used in the course.
- Students will communicate orally by answering questions in class and participating in any group discussion.

Empirical and Quantitative Skills (to include the manipulation and analysis of numerical data or observable facts resulting in informed conclusions):

The following empirical and quantitative skills will be assessed on quizzes, homework, and exams.

- Students will analyze limits numerically to determine the sign of the infinite limit.
- Students will analyze numerical data in determining the signs of the first and second derivative in order to make conclusions on the shape of the graph.
- Students will compute derivatives and interpret the results as they relate to tangent line, velocity, and other rate of change problems.
- Students will numerically approximate the values of a function by using the tangent line approximation.
- Students will calculate antiderivatives of functions and use initial data to determine any unknown constants.
Texas A&M University

Core Curriculum

Initial Request for a Course Addition to the Fall 2014 Core Curriculum

- Students will make conclusions involving maximum and minimum values of functions (both local and absolute) based on information from the derivative.
- Students will manipulate given information to develop a function to be used in optimization problems and then apply calculus to find and interpret the optimal solution.
- Students will approximate the value of a definite integral numerically using Riemann sums.
- Students will compute definite integrals and interpret the results as they relate to area under a curve.
- Students will manipulate given information to create a related rate model involving known quantities, and then apply calculus to solve for an unknown rate of change.

Please be aware that instructors should be prepared to submit samples/examples of student work as part of the future course recertification process.
MATH 171  
Fall 2013  
Section TBA, Class Time: TBA, Location: TBA

Instructor Information:
Instructor: Benjamin Aurispa  
Office: Blocker 630D  
Phone: (979) 862-4192
Office Hours: TBA. Also by appointment
E-mail: baurispa@math.tamu.edu. Please include your name and section number in any email you send me.
Check your TAMU email account daily, because this is where class emails will be sent. You are responsible for any announcements made through email.
Webpage: www.math.tamu.edu/~baurispa  — Check regularly for announcements and important information, as well as for lecture notes, a course schedule, and other helpful links.

Required Materials:

Calculator Policy: Calculators are not allowed on exams or quizzes, although they may be used on homework assignments.

Course Policies:
Grading:

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<thead>
<tr>
<th></th>
<th>Weight</th>
<th>Final Grade Ranges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework:</td>
<td>10%</td>
<td>90% ≤ A ≤ 100%</td>
</tr>
<tr>
<td>Quizzes:</td>
<td>15%</td>
<td>80% ≤ B &lt; 90%</td>
</tr>
<tr>
<td>3 In-Class Exams:</td>
<td>3 @ 17% each</td>
<td>70% ≤ C &lt; 80%</td>
</tr>
<tr>
<td>Final Exam:</td>
<td>24%</td>
<td>60% ≤ D &lt; 70%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0% ≤ F &lt; 60%</td>
</tr>
</tbody>
</table>

Due to FERPA privacy issues, I cannot discuss grades over email or phone. If you have a question about your grade, please come see me in person.

Exams: There will be 3 in-class exams during the semester. Bring your Texas A&M student ID to all exams. The tentative material and dates for the exams are as follows:

Exam 1: TBA  
(Sections 1.1-1.3, 2.2-2.7, 3.1)

Exam 2: TBA  
(Sections 3.2, 3.4-3.11, 4.1-4.2)

Exam 3: TBA  
(Sections 4.3-4.4, 4.6, 4.8, 5.1-5.3, 5.5, 5.7, 6.1-6.2)

Final Exam: The final exam will be a cumulative (comprehensive) exam. The day and time of the final exam are determined by the university. The final will be on TBA.

Graded Homework: Homework assignments for a grade will be given about once a week. Homework assignments are due at the BEGINNING of class on the due date. Assignments turned in between 10 minutes after the start of class and the end of the day will receive a 10% penalty. Assignments turned in by the end of the next day will receive a 25% penalty. After this, no late work will be accepted.

Suggested Homework: Math cannot be learned by watching someone else do math. It requires a lot of practice. On my webpage there is a list of suggested homework. I STRONGLY suggest that you do these problems for more practice in addition to the graded homework. They will not be collected, but doing them to help you learn the material is very important.

Quizzes: There will be quizzes given weekly during your Tuesday class (except for exam weeks). The best way to prepare for these quizzes is to practice problems by doing the suggested homework. There may also be quizzes given periodically during other classes, either announced or unannounced, as well as take-home quizzes.

Make-up Policy: Make-up exams and quizzes or late homework will NOT be allowed unless a University approved reason is given to me in writing. Notification before the absence is required when possible. Otherwise, you must notify me within 2 working days of the missed exam, quiz, or assignment to arrange a makeup. See University Student Rules for more guidelines. In all cases where an exam/quiz/assignment is missed due to an injury or illness, whether it be more or less than 3 days, I require a doctor's note. Further, an absence due to a non-acute medical service or appointment (such as a regular checkup) is not an excused absence.

Providing a fake or falsified doctor's note is considered academic dishonesty, will be reported to the Aggie Honor Council, and will result in an F* in the course.
Grade Appeals: If you believe an error has been made in grading, you have until the next class period after the exam, quiz, or assignment has been handed back to let me know. Otherwise, you must accept the grade you received.

Help Session and Week in Review: Help sessions are come-and-go times where you can ask questions and get help with your homework from the student Help Session leaders. The Week in Review is a weekly session led by an instructor to review the topics of the previous week and to provide additional examples. On exam weeks, the Week in Review is an Exam Review. Although there are not Help Sessions and Week in Reviews directly for Math 171, please feel free to attend those for Math 151. See the links on my webpage for locations and times.

Other Sources of Help: There are streaming videos online with extra problems that you can take advantage of. There are also many past common exams and old Week in Review problem sets for Math 151 that you can additionally use to practice the material.

Classroom Respect: Please refrain from using electronic devices other than your calculator during class. Texting and playing on your phone or computer distracts not only you, but also those around you. If you would like to use a laptop during class to take notes with, please ask for permission prior to doing so.

Copyright: All printed handouts and web-materials are protected by US Copyright Laws. No multiple copies can be made without written permission by the instructor.

ADA Policy: The American with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, in Cain Hall, Room B118, or call 845-1637. For additional information visit http://disability.tamu.edu.

Academic Integrity Statement: Creating and other forms of academic dishonesty will not be tolerated. Please do not compromise your integrity for the sake of temporary benefits.

Aggie Honor Code: “An Aggie does not lie, cheat, or steal, or tolerate those who do.”

Upon accepting admission to Texas A&M University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning, and to follow the philosophy and rules of the Honor System. Students will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules does not exclude any member of the TAMU community from the requirements of the processes of the Honor System. For more information on academic integrity, see the Honor Council Rules and Procedures at http://www.tamu.edu/aggiehonor.

Note: As with any math class, it is very important that you keep up with the material and that you do not fall behind. Please don’t hesitate to ask questions in class, to come to my office hours, or to send me an e-mail. My goal is not to cram information into your head, but to help you learn. If you are not understanding the concept, please ask for help. Don’t wait until the day before an exam to try and grasp the material. There are Help Sessions regularly as well as my office hours, streaming videos, and other materials online. Please take advantage of these resources.

Tentative Schedule:
Week 1 - 1.1 (Vectors), 1.2 (The Dot Product)
Week 2 - 1.2, 1.3 (Vector Functions), 2.2 (Limit of a Function)
Week 3 - 2.2, 2.3 (Calculating Limits Using Limit Laws), 2.4 (Precise Definition of a Limit), 2.5 (Continuity)
Week 4 - 2.6 (Limits at Infinity; Horizontal Asymptotes), 2.7 (Tangents, Velocities, and Other Rates of Change), 3.1 (Derivatives)
Week 5 - 3.2 (Differentiation Formulas), 3.4 (Derivatives of Trigonometric Functions), Exam 1
Week 6 - 3.4, 3.5 (The Chain Rule), 3.6 (Implicit Differentiation)
Week 7 - 3.7 (Derivatives of Vector Functions), 3.8 (Higher Derivatives), 3.9 (Slopes and Tangents of Parametric Curves), 3.10 (Related Rates)
Week 8 - 3.10, 3.11 (Differential; Linear Approximations), 4.1 (Exponential Functions and Their Derivatives), 4.2 (Inverse Functions)
Week 9 - 4.2, 4.3 (Logarithmic Functions), 4.4 (Derivatives of Logarithmic Functions), Review, Exam 2
Week 10 - 4.4, 4.6 (Inverse Trigonometric Functions), 4.8 (Integration Forms and L’Hospital’s Rule), 5.1 (What does f’ say about f?)
Week 11 - 5.2 (Maximum and Minimum Values), 5.3 (Derivatives and Shapes of Curves), 5.5 (Applied Maximum and Minimum Problems)
Week 12 - 5.5, 5.7 (Antiderivatives), 6.1 (Sigma Notation)
Week 13 - 6.1, 6.2 (Area)
Week 14 - 6.3 (The Definite Integral), 6.4 (The Fundamental Theorem of Calculus), Review, Exam 3
Week 15 - 6.4, Review
MATH 171 – Analytic Geometry and Calculus
Texas A&M University

Catalog Description: Vectors, functions, limits, derivatives, Mean Value Theorem, applications of derivatives, integrals, Fundamental Theorem of Calculus. Designed to be more demanding than MATH 151. Prerequisite: MATH 150 or equivalent or acceptable score on TAMU Math Placement Exam. Credit will not be given for more than one of MATH 131, MATH 142, MATH 147, MATH 151 and MATH 171.

Learning Outcomes
This course focuses on quantitative literacy in mathematics along with real world applications to physics, related rate problems, and optimization. Upon successful completion of this course, students will be able to:

- Understand vectors and vector functions, both graphically and quantitatively, and apply them to real world situations involving velocity, forces, and work.
- Construct vector and parametric equations of lines and understand vector functions and their relationship to parametric equations.
- Understand the concept of a limit graphically, numerically, and algebraically, and apply the relationship between limits, continuity, and differentiability in determining where a function is continuous and/or differentiable.
- Conceptually understand the precise definition of a limit involving epsilon and delta.
- Define the limit definition of the derivative and calculate derivatives using the limit definition, differentiation formulas, the chain rule, and implicit differentiation, with applications to tangent line and velocity problems.
- Calculate limits and derivatives of vector functions with applications to physics such as computing velocity and acceleration vectors.
- Identify exponential, logarithmic, and inverse trigonometric functions, and compute limits and derivatives involving these classes of functions.
- Apply the derivative to mathematically model velocity and acceleration as well as real world related rate applications, such as calculating the rate at which the distance between two moving objects is changing or the rate at which the volume of a cone being filled with water is changing.
- Approximate functions and function values using the derivative and the tangent line.
- Identify and understand indeterminate forms and apply the derivative to calculate limits using L’Hospital’s Rule.
- Understand and apply the Intermediate Value Theorem and the Mean Value Theorem, and be able to logically determine when these theorems can be used.
- Use calculus and logic to sketch graphs of functions and analyze their properties, including where a function is increasing/decreasing and in describing the concavity of the function.
- Determine the maximum/minimum values of functions, including applied optimization problems.
- Compute antiderivatives and understand the concept of integration as it relates to area and Riemann sums.
- Articulate the relationship between derivatives and integrals using the Fundamental Theorem of Calculus, and evaluate definite integrals using the Fundamental Theorem of Calculus.
- Explain and/or prove various formulas or theorems used in the course.

Core Objectives

Critical Thinking

- Students will think critically about limits in determining how the limit conceptually relates to the behavior of the function.
- Students will analyze the limit of a function at a point using the precise definition of the limit.
- Students will think critically about continuity and differentiability to justify whether a function is continuous and/or differentiable at a point.
- Students will evaluate the proper technique to use when computing limits and derivatives of functions.
- Students will synthesize data determined from the first and second derivatives to determine the properties and shape of a function.
- Students will use inquiry to determine on what intervals a function is increasing/decreasing and to determine the intervals of concavity of the function by analyzing the signs of the first and second derivatives.
- Students will innovatively think about how to solve related rate word problems and optimization problems.
- Students will analyze functions using continuity and the derivative in determining the maximum and minimum values of the function, and if they exist.
- Students will develop a critical understanding of the relationship between the derivative and the integral using the Fundamental Theorem of Calculus.
Communication Skills

- Students will recognize and construct graphs of basic functions, including polynomials, exponential functions, logarithmic functions, and trigonometric functions.
- Students will justify solutions to optimization problems in writing.
- Students will interpret information from the derivatives of a function in order to develop a visual sketch of the graph of the function and to communicate in writing the properties of the function.
- Students will identify points of discontinuity and non-differentiability by examining the graphs of functions.
- Students will express mathematical concepts, such as the definition of the derivative, both abstractly with equations and in writing solutions to problems.
- Students will develop solutions to problems that involve the use of theorems, such as the Squeeze Theorem, the Intermediate Value Theorem, and the Mean Value Theorem.
- Students will use graphs of functions to determine the value of definite integrals as they relate to area.
- Students will be able to explain and/or prove various formulas or theorems used in the course.
- Students will communicate orally by answering questions in class and participating in any group discussion.

Empirical and Quantitative Skills

- Students will analyze limits numerically to determine the sign of the infinite limit.
- Students will analyze numerical data in determining the signs of the first and second derivative in order to make conclusions on the shape of the graph.
- Students will compute derivatives and interpret the results as they relate to tangent line, velocity, and other rate of change problems.
- Students will numerically approximate the values of a function by using the tangent line approximation.
- Students will calculate antiderivatives of functions and use initial data to determine any unknown constants.
- Students will make conclusions involving maximum and minimum values of functions (both local and absolute) based on information from the derivative.
- Students will manipulate given information to develop a function to be used in optimization problems and then apply calculus to find and interpret the optimal solution.
- Students will approximate the value of a definite integral numerically using Riemann sums.
- Students will compute definite integrals and interpret the results as they relate to area under a curve.
- Students will manipulate given information to create a related rate model involving known quantities, and then apply calculus to solve for an unknown rate of change.