Math 131 - Mathematical Concepts - Calculus  Spring 2012

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 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.
Instructor          Kendra Kilmer
Office              Blocker 641B
Phone               None. The main math office number is (979) 845-3261
E-mail              kilmer@math.tamu.edu
Web Page            www.math.tamu.edu/~kilmer
Office Hours        Monday and Wednesday 1-2:30 pm

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 registered 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 page 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 Quizzes and Take-Home Assignments. Quizzes will be given in class. Quizzes 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:

<table>
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<tr>
<th>Exam</th>
<th>Date</th>
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<tbody>
<tr>
<td>Exam 1</td>
<td>Wednesday, 15/February/2012</td>
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<tr>
<td>Exam 2</td>
<td>Friday, 23/March/2012</td>
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<tr>
<td>Exam 3</td>
<td>Friday, 20/April/2012</td>
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Final Exam: The final exam will be comprehensive and will consist of multiple choice problems only. The final exam schedule is as follows:

<table>
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<tr>
<th>Section</th>
<th>Class Time</th>
<th>Final Exam Date and Time</th>
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</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>
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<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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Grading: A(90-100%), B(80-89%), C(70-79%), D(60-69%), F(0-59%)

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<th>Component</th>
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<tr>
<td>3 Exams</td>
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<td>Computer Homework</td>
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<td>Daily Grades</td>
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<td>Final Exam</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 Explanatory 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, 23-27, 29, 31, 33, 35, 41, 43, 45, 51, 53, 61
Section 1.5 - 1, 3, 9, 11, 15, 17, 21, 29, 31, 33
Section 1.6 - 1, 5, 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, 9, 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, 55, 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, 25, 29
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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LEGEND: X:Exam R:Review NC:No Class