Engineering Mathematics I

MATH 151, FALL 2016

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Meeting Times-Location

Lectures:	TR 3:55-5:10pm	Classroom: HELD 105
Office hours:	MTWR 2:00-3:30pm	
Recitations:	Section 579: W 12:40-1:30pm	Classroom: NGLE 104
	Section 580: W 1:50-2:40pm	Classroom: ENPH 216
	Section 581: W 3:00-3:50pm	Classroom: CVE 136
MATLAB:	Section 579: M 12:40-1:30pm	Classroom: BLOC 123
	Section 580: M 1:50-2:40pm	Classroom: BLOC 122
	Section 581: M 3:00-3:50pm	Classroom: BLOC 122

Global Course Description

Name: Engineering Mathematics I

Course Webpage: `http://www.math.tamu.edu/~florent/teaching/151_fall16.html`

Course Description: (Credit 4) Rectangular coordinates, vectors, analytic geometry, functions, limits, derivatives of functions, applications, integration, computer algebra. MATH 171 designed to be a more demanding version of this course. No credit will be given for more than one of MATH 131, MATH 142, MATH 147, MATH 151 and MATH 171.

Textbooks:

- Textbook: Stewart, *Calculus: Early Vectors*, Cengage Learning. The textbook is available in different formats. You can buy a hard-back or loose-leaf copy or you can purchase an eBook within the online system WebAssign. See the link below for more information on WebAssign and purchasing options: `www.math.tamu.edu/courses/eHomework/`.
- Lab Manual: Gilat-Amos, *MATLAB: An Introduction with Applications*, 5th edition, Wiley

Prerequisities: MATH 150 or equivalent or acceptable score on TAMU Math Placement Exam.

Calculator Policy: Calculators are not allowed on exams or quizzes, although they may be used, and are often necessary, on homework assignments. Use of a calculator on a quiz or exam is considered academic dishonesty and will be reported to the Aggie Honor Council.

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.

Tentative Schedule:

Week 1: Review of Trigonometry; Vectors Appendix D and Section 1.1

Week 2: The Dot Product; Vector Functions; The Limit of a Function Sections 1.2-1.3, 2.2

Week 3: Calculating Limits; Continuity; Limits at Infinity and Horizontal Asymptotes Sections 2.3, 2.5-2.6

Week 4: Tangents, Velocities, and Other Rates of Change; Derivatives Sections 2.7, 3.1

Week 5: Differentiation Formulas Exam 1 (Covers 1.1 through Section 3.1) Section 3.2

Week 6: Derivatives of Trig Functions; The Chain Rule; Implicit Differentiation Sections 3.4-3.6

Week 7: Derivatives of Vector Functions; Higher Derivatives; Slopes and Tangents to Parametric Curves; Related Rates Sections 3.7-3.10

Week 8: Differentials, Linear and Quadratic Approximations; Exponential Functions and their Derivatives Sections 3.11, 4.1

Week 9: Inverse Functions, Logarithmic Functions Exam 2 (Covers 3.2 through Section 4.2). Sections 4.2-4.3

Week 10: Derivatives of Logarithmic Functions; Exponential Growth and Decay; Inverse Trig Functions Sections 4.4-4.6

Week 11: L'Hospital's Rule; What does f' say about f; Max/Min Values Sections 4.8, 5.1-5.2

Week 12: Derivatives and Shapes of Curves; Applied Max/Min Word Problems; Antiderivatives Sections 5.3, 5.5, 5.7

Week 13: Sigma Notation; Area; Thanksgiving Holiday Sections 6.1-6.2 Exam 3 (Covers 4.2 through Section 6.1), The Definite Integral; The

Week 14/15: Fundamental Theorem of Calculus Sections 6.3-6.4

Exams Policy

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 time. The dates for the exams and the tentative content are as follows:

- Common Exam #1: Thursday, September 29, 7:30-9:30pm (1.1 through 3.1)
- Common Exam #2: Thursday, October 27, 7:30-9:30pm (3.2 through 4.2)
- Common Exam #3: Tuesday, November 29, 7:30-9:30pm (4.3 through 6.1)

For Common Exams #1 and #2 only, if your score is below a 70, you will have the opportunity to take a different exam covering the same content to improve your grade. The maximum score you may earn on a retest is 70, and if your score on the retest is higher than your first attempt, it will replace your original score, up to the maximum of 70.

Final exam:

The final exam will be a cumulative (comprehensive) exam and is required for all students. If your final exam grade is higher than your lowest test grade, the grade on your final will replace your lowest test grade in the course grade calculation. The day and time of the final exam are determined by the University.

- Final Exam: Tuesday December 13, 2016, 1-3pm, in the regular classroom.

Graded Homework: Graded homework assignments will be done online in WebAssign. For important information such as how to purchase access, how to log in and take assignments, the Student Help Request Form, and other WebAssign issues, please see `http://www.math.tamu.edu/courses/eHomework`. I suggest you bookmark this page and visit it before you log in to WebAssign each time.

Final Grade: final grade = 20% final exam + 20% common exam #1 + 20% common exam #2 + 20% common exam #3 + 10% quizzes + 5% lab + 5% WebAssign homework.

Grading: A 90-100% B 80-89% C 67-79% D 57-66% F 0-56%

Appeal: 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. 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. You have the possibility to check your grades via the eCampus website. It is your responsibility to verify that the grades reported online correspond to your actual grades.

Lab and Recitations

Your section will meet twice weekly with your TA for a recitation and a lab session. In lab you will complete MATLAB assignments. You must attend the recitation and lab you are registered for. During the recitation sessions, activities will be assigned. The students will work in groups of 3 or 4, and during recitation they will complete the activity with the supervision/help of the Teaching Assistant. At the end of the recitation, students must turn in the activity answer sheet for grading. This grade will not be used in the final grade calculation but will be used to resolve borderline cases.

Quizzes

You will have to take a quiz on (approximately) a weekly basis at the beginning of each lab assignment. The quizzes are short, concise and straightforward. The material for a quiz will be very similar to the material of the previous activity. They are excellent indicators to how well you keep up with the pace of the class.

Attendance and Make-up Exam Policies

- Excused absences: The University views class attendance as an individual student responsibility. It is essential that students attend class and complete all assignments to succeed in the course. University student rules concerning excused and unexcused absences as well as makeups can be found at http://student-rules.tamu.edu/rule07. In particular, make-up exams, make-up quizzes or late homework/labs 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 or quiz to arrange a makeup. 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. I will not accept the "University Explanatory Statement for Absence from Class" form. 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 or other falsified documentation is considered academic dishonesty, will be reported to the Aggie Honor Council, and will result in an F in the course.
- Missed recitation activities, or lab assignments will not be made up. You will be allowed to make up a missed exam during one of the scheduled make-up times provided by the Math Department. According to Student Rule 7, you are expected to attend the scheduled make-up unless you have a University-approved excuse for missing the make-up time as well. If there

are multiple make-up exam times, you must attend the earliest make-up time for which you do not have a University-approved excuse. The list of make-up times will be available at `http://www.math.tamu.edu/courses/makeupexams.html`

Miscellaneous

Academic Integrity Statement

Cheating and other forms of academic dishonesty will not be tolerated.

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 or the processes of the Honor System. For additional information please visit: `http://aggiehonor.tamu.edu`

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, currently located in the Disability Services building at the Student Services at White Creek complex on west campus or call 979-845-1637. For additional information, visit http://disability.tamu.edu.

Copyright Policy

All printed materials disseminated in class or on the web are protected by copyright laws. While personal use is permitted, sale of any of these materials is strictly prohibited.

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.Core Objectives