TEXAS A&M UNIVERSITY

Fall 2019
Math 151: Engineering Mathematics I

CLASS TIMES AND LOCATIONS

- Lecture for 151.507 – 509: TR 9:35 – 10:50 AM in Heldenfels 105

Recitation for Section 507	WF 9:10 – 10:00 AM	W: Blocker 122	F: Haynes Engineering 136
Recitation for Section 508	WF 11:30 AM – 12:20 PM	W: Blocker 124	F: Haynes Engineering 222
Recitation for Section 509	WF 12:40 – 01:30 PM	W: Blocker 124	F: Haynes Engineering 222

- Lecture for 151.510 – 512: TR 11:10 AM – 12:25 PM in Heldenfels 105

Recitation for Section 510	WF 8:00 – 8:50 AM	W: Blocker 124	F: Haynes Engineering 222
Recitation for Section 511	WF 9:10 – 10:00 AM	W: Blocker 124	F: Haynes Engineering 222
Recitation for Section 512	WF 10:20 – 11:10 AM	W: Blocker 124	F: Haynes Engineering 222

- Lecture for 151.519 – 521: TR 3:55 – 5:10 PM in Mitchell Physics 204

Recitation for Section 519	WF 9:10 – 10:00 AM	W: Blocker 126	F: Haynes Engineering 223
Recitation for Section 520	WF 10:20 – 11:10 AM	W: Blocker 126	F: Haynes Engineering 223
Recitation for Section 521	WF 11:30 AM – 12:20 PM	W: Blocker 126	F: Haynes Engineering 223

CATALOG DESCRIPTION AND PREREQUISITES

Engineering Mathematics I (Math 2413) 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. Only one of the following will satisfy the requirements for a degree: MATH 131, MATH 142, MATH 147, MATH 151 and MATH 171. *Prerequisite*: MATH 150 or acceptable score on TAMU Math Placement Exam.

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.

INSTRUCTOR INFORMATION

Name	Richard G. Lynch
Email	rglynch@tamu.edu
Office	Blocker 211C
Office Hours	TR 1:45 – 3:30 PM, W 1:30 – 4:30 PM, by appointment (online meetings via Zoom are also available)
Course Page	All content will be posted inside eCampus.
Phone	Math Department: 979-845-3261 (There is no phone in my office, so email is a better way to reach me.)

REQUIRED MATERIALS

TEXTBOOK:

Calculus: Early Transcendentals (Custom Edition) by Stewart; Cengage Learning
Note: You will be required to purchase access to the online homework system, WebAssign, but doing so **will automatically** give you access to the eBook version of the text. The textbook is available in different formats, and there are a variety of purchasing options available (course specific access or Cengage Unlimited). Purchase can be made through the local bookstores or directly in WebAssign. Starting on the first day of classes, you will be granted access for a trial period while you determine the appropriate purchasing option for you.

WEBASSIGN ACCESS: WebAssign will be used for homework in this class. In order to use WebAssign, you must purchase access. For access, purchasing information and options, please visit

http://www.math.tamu.edu/courses/eHomework/

CALCULATOR POLICY: Calculators are not allowed on Quizzes or Exams.

TEXAS A&M STUDENT ID: Bring your student ID to each class.

TENTATIVE COURSE TOPICS AND CALENDAR OF ACTIVITIES

	TOPIC	SECTIONS
Week 1: 8/26 – 8/30	Vectors; The Dot Product	Appendix J1, Appendix J2
Week 2: 9/2 – 9/6	Vector Functions and Parametric Curves; Inverse Trigonometric Functions; The Limit of a Function	Appendix J3, 1.5, 2.2
Week 3: 9/9 – 9/13	Calculating Limits using Limit Laws; Continuity; Limits at Infinity and Horizontal Asymptotes	2.3, 2.5, 2.6
Week 4: 9/16 – 9/20	Derivatives and Rates of Change; The Derivative as a Function; Derivatives of Polynomial and Exponential Functions	2.7, 2.8, 3.1
Week 5: 9/23 – 9/27	The Product and Quotient Rules; Derivatives of Trigonometric Functions; **EXAM I (Appendix J1 through 2.8)**	3.2, 3.3
Week 6: 9/30 – 10/4	The Chain Rule; Implicit Differentiation; Derivatives of Inverse Trigonometric Functions; Derivatives of Logarithmic Functions	3.4, 3.5, 3.6
Week 7: 10/7 10/11	Derivatives of Vector Functions; Slopes and Tangents to Parametric Curves; Rates of Change in the Natural and Social Sciences; Exponential Growth and Decay	Appendix K1, Appendix K2, 3.7, 3.8
Week 8: 10/14 – 10/18	Related Rates; Linear Approximations and Differentials	3.9, 3.10
Week 9: 10/21 – 10/25	Maximum and Minimum Values; **EXAM II (3.1 through 3.10)**	4.1
Week 10: 10/28 – 11/1	The Mean Value Theorem; How Derivatives Affect the Shape of a Graph; Indeterminate Forms and L'Hospital's Rule	4.2, 4.3, 4.4
Week 11: 11/4 – 11/8	L'Hospital's Rule cont.; Optimization Problems; Antiderivatives	4.4, 4.7, 4.9
Week 12: 11/11 – 11/15	Areas and Distances; The Definite Integral; The Fundamental Theorem of Calculus	5.1, 5.2, 5.3
Week 13: 11/18 – 11/22	Fundamental Theorem of Calculus cont.; **EXAM III (4.1 through 5.2)**	5.3
Week 14: 11/25 – 11/29	Indefinite Integrals and the Net Change Theorem; The Substitution Rule, **Thanksgiving**	5.4, 5.5
Week 15: 12/2 – 12/6	Review for Final Exam, Final Exams	
Week 16: 12/9 – 12/13	Final Exams	

GRADING POLICIES

The course grading will be based on the tables below. At the end of the semester you will receive the grade you *earned*, according to the scale given. 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.

GRADE BREAKDOWN

Activity	Date	Percentage
Homework	Weekly	7.5%
Quizzes	Weekly	7.5%
Labs	See Lab Schedule	5%
Common Exam I	9/26/19	20%
Common Exam II	10/24/19	20%
Common Exam III	11/21/19	20%
Final Exam	See below	20%
TOTAL		**100%**

GRADING SCALE

Range	Grade
90 ≤ Average ≤ 100	**A**
80 ≤ Average < 90	**B**
67 ≤ Average < 80	**C**
57 ≤ Average < 67	**D**
Average < 57	**F**

GRADE APPEAL POLICY: If you believe an error has been made in grading of an exam, you have one week from the return of the exam to let me know. No changes will be made after this one-week period. The only exception to this policy is if the points on the exam are totaled incorrectly, in which case you may discuss this with me at any time. You must present the actual assignment to me before any consideration is made. For quizzes, please consult your lab instructor.

HOMEWORK

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. You must log in to WebAssign through the TAMU WebAssign login page at www.webassign.net/tamu/login.html. **At least one homework assignment will be dropped when computing the average.**

QUIZZES AND LABS

Each section will meet twice weekly for lab and recitation. You will take weekly quizzes for a grade and will work in groups to complete Python assignments. Lab assignments and due dates will be posted online. **At least one quiz grade will be dropped when computing the average.**

EXAMS

There will be **three 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 later. The tentative exam schedule is as follows:

Common Exam I: Thursday September 26, 7:30 – 9:30 PM
Common Exam II: Thursday October 24, 7:30 – 9:30 PM
Common Exam III: Thursday November 21, 7:30 – 9:30 PM

For Common Exam I only, if you score 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 the retest is 70. If you make above a 70 on the retest, your score is recorded as a 70. If your score on the retest is higher than your original score, it will replace your original score, up to the maximum of 70. Tentatively, the retest will be given two weeks after the common exam on Friday, October 11.

FINAL EXAM

The final exam will be **comprehensive** 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 that test grade in the final grade calculation. The final exam schedule is as follows:

Sections	Class Time	Final Exam Date, Time, and Location
507 – 509	TR 9:35 – 10:50 AM	Friday, Dec 6: 12:30 – 2:30 PM in Heldenfels Hall 105
510 – 512	TR 11:10 AM – 12:25 PM	Friday, Dec 6: 3:00 – 5:00 PM in Heldenfels Hall 105
519 – 521	TR 3:55 – 5:10 PM	Tuesday, Dec 10: 1:00 – 3:00 PM in Mitchell Physics 204

(You can refer to **http://registrar.tamu.edu//General/FinalSchedule.aspx** for the University final exam schedule.)

ATTENDANCE AND MAKE-UP POLICIES

Attendance is essential to complete this course successfully.

- 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 https://student-rules.tamu.edu/rule07/.
- **Excused Absences**: 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 and quizzes or late homework/labs/activities will NOT be allowed unless a **University approved reason is given to me in writing**. Notification *before* the absence is **required** when possible. Otherwise (e.g. accident, or emergency), you must notify me **within 2 working days** of the missed exam, quiz, or assignment 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.
- If you miss a quiz in recitation, please consult your TA and provide them with the proper documentation as they will be the one to provide the makeup.
- Makeup exams will only be allowed provided the absence is excused. You must schedule the makeup with me during one of the scheduled makeup times provided by the Math Department. You are required to attend the earliest scheduled makeup following your absence unless you have a University-approved excuse for missing that makeup time as well. The list of makeup times will be available at http://www.math.tamu.edu/courses/makeupexams.html.

ACADEMIC INTEGRITY

"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/**.

- Providing a fake or falsified doctor's note or other falsified documentation will result in an F* in the course.
- Using a calculator, other technology (e.g. a cell phone) or other resources (such as a note sheet, classmate's exam, etc.) on an exam or a quiz will result in a zero on the assignment. A zero on an exam for cheating will not be replaced by the retest exam or by the final exam. A zero on a quiz for cheating will not be dropped when computing your quiz average.
- For assignments that are not exams or quizzes, copying solutions from other sources (i.e. the internet, other groups, friends in other classes or past classes, etc.) is considered academic dishonesty. Since the Python assignments are group assignments, all members of the group may be held responsible for the academic dishonesty of individual group members.

Instances of Academic dishonesty will be reported to the Aggie Honor Council. The punishment for cheating may be increased if the student has been found to have committed academic dishonesty in other courses.

AMERICANS WITH DISABILITIES ACT (ADA)

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**.

If you require accommodations, please see me as soon as possible so that we can make sure you have the necessary paperwork in order.

Title IX and Statement on Limits to Confidentiality

Texas A&M University and the College of Science are committed to fostering a learning environment that is safe and productive for all. University policies and federal and state laws provide guidance for achieving such an environment. Although class materials are generally considered confidential pursuant to student record policies and laws, University employees — including instructors — cannot maintain confidentiality when it conflicts with their responsibility to report certain issues that jeopardize the health and safety of our community. As the instructor, I must report (per Texas A&M System Regulation 08.01.01) the following information to other University offices if you share it with me, even if you do not want the disclosed information to be shared:

• Allegations of sexual assault, sexual discrimination, or sexual harassment when they involve TAMU students, faculty, or staff, or third parties visiting campus.

These reports may trigger contact from a campus official who will want to talk with you about the incident that you have shared. In many cases, it will be your decision whether or not you wish to speak with that individual. If you would like to talk about these events in a more confidential setting, you are encouraged to make an appointment with the Student Counseling Service (https://scs.tamu.edu/).

Students and faculty can report non-emergency behavior that causes them to be concerned at http://tellsomebody.tamu.edu.

ADDITIONAL HELP & PREPARING FOR EXAMS

WEEK-IN-REVIEW (WIR)

There will be Week-in-Review sessions conducted weekly, starting the second week of classes. Each review is open to all Math 151 students to review the topics of the previous week and to provide additional examples. The Week-in-Review schedule can be found at

http://www.math.tamu.edu/courses/weekinreview.html

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