TEXAS A&M UNIVERSITY

# Math 151 Syllabus

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|---|---|
| Course title and number | MATH 151 – Engineering Mathematics I<br>Sections 507-512 |
| Term | Fall 2017 |
| Class times and location | Sections 507-509 Lecture: TR 9:35-10:50am HELD 105<br>Sections 510-512 Lecture: TR 11:10-12:25pm HELD 105 |

Lab/Recitation:
507 –

W 9:10-10:00am BLOC 122
F 9:10-10:00am Haynes Engineering Building 136

508 –

W 11:30-12:20pm BLOC 124
F 11:30-12:20pm Haynes Engineering Building 222

509 –
W 12:40-1:30pm BLOC 124
F 12:40-1:30pm Haynes Engineering Building 222

510 –

W 8:00-8:50am BLOC 124
F 8:00-8:50am Haynes Engineering Building 222

511 –

W 9:10-10:00am BLOC 124
F 9:10-10:00am Haynes Engineering Building 222

512 –

W 10:20-11:10am BLOC 124
F 10:20-11:10am Haynes Engineering Building 222

## Instructor Information

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|---|---|
| Name | Alicia Harper |
| My Webpage<br>Departmental Webpage | aliciaharper.xyz<br>www.math.tamu.edu/courses/math151/ |
| Phone number | Department of Mathematics: 979-845-3261 |
| Email address | adharper@math.tamu.edu |
| Office<br>Office hours | BLOC 601B<br>Monday 1-4 (Tentative) |

## Course Description and Prerequisites

**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.

**Prerequisites**: 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.

## Textbook and/or Resource Material

- *Textbook:* Stewart, *Calculus: Early Transcendentals, 8th edition,* 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.

- *Lab Manual:* Gilat-Amos, *MATLAB: An Introduction with Applications, 6th edition*, Wiley

- *WebAssign Account Access Code:* WebAssign will be used for homework in this class. In order to use WebAssign, you must purchase an access code. For access code and textbook purchasing information and options, please see the Student Information Page at
  **http://www.math.tamu.edu/courses/eHomework/**

## Grading Policies

The course grading will be based on the tables below. 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 | Percent |
|---|---|---|
| **Homework** | Weekly | **7%** |
| **Quizzes** | Weekly | **8%** |
| **Labs** | See Lab Schedule | **5%** |
| **Common Exam I** | Thursday, September 27, 7:30-9:30pm | **20%** |
| **Common Exam II** | Thursday, October 25, 7:30-9:30pm | **20%** |
| **Common Exam III** | Monday, November 19, 7:30-9:30pm | **20%** |
| **Final Exam** | Sections 507-509<br><br>Friday, December 7, 2018<br>12:30 – 2:30 p.m<br>HELD 105<br><br>Sections 510-512<br><br>Friday, December 7, 2018<br>3:00 – 5:00 p.m<br>HELD 105 | **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 |

## Attendance and Makeup 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 and 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, 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. 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.

**Makeup** exams will only be allowed provided the above guidelines are met. You will be allowed to make up a missed exam during one of the scheduled makeup times provided by the Math Department. According to Student Rule 7, you are expected to attend the scheduled makeup unless you have a University-approved excuse for missing the makeup time as well. If there are multiple makeup exam times, you must attend the ***earliest*** makeup time for which you do not have a University-approved excuse. The list of makeup times will be available at http://www.math.tamu.edu/courses/makeupexams.html

## Additional Course Information and Policies

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 27, 7:30-9:30pm (Supplement I through 2.8)**
**Common Exam 2:** **Thursday, October 25, 7:30-9:30pm (3.1 through 3.10 including Supplement II)**
**Common Exam 3:** **Monday, November 19, 7:30-9:30pm (4.1 through 5.2)**

For Common Exam 1, if you take the exam and 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 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. Tentatively, the retest will be given two weeks after the common exam on Friday evening.

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 taken common exam score, then 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 and are given below.

Sections 507-509

Friday, December 7, 2018
12:30 – 2:30 p.m
HELD 105

Sections 510-512

Friday, December 7, 2018
3:00 – 5:00 p.m
HELD 105

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.

Lab/Recitation: Your section will meet twice weekly for recitation and lab. In recitation sessions, you will take weekly quizzes. In lab you will complete MATLAB assignments. You must attend the recitation and lab you are registered for.

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.

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.

Additional Helpful Links:

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| Help Sessions | http://www.math.tamu.edu/courses/helpsessions.html |
| Week in Reviews | http://www.math.tamu.edu/courses/weekinreview.html |
| Academic Calendar | http://registrar.tamu.edu/General/Calendar.aspx |
| Final Exam Schedule | http://registrar.tamu.edu/General/FinalSchedule.aspx |

**COURSE TOPICS** (Tentative weekly schedule)

| *WEEK* | *TOPIC* | *SECTIONS COVERED* |
|---|---|---|
| *1* | Vectors; The Dot Product | Supplement I |
| *2* | Parametric Equations and Vector Functions; Inverse Trigonometric Functions; The Limit of a Function | Supplement I, Sections 1.5, 2.2 |
| *3* | Calculating Limits Using Limit Laws; Continuity; Limits at Infinity and Horizontal Asymptotes | Sections 2.3, 2.5-2.6 |
| *4* | Derivatives and Rates of Change; The Derivative as a Function; Derivatives of Polynomial and Exponential Functions; | Sections 2.7-2.8, 3.1 |
| *5* | The Product and Quotient Rules; Derivatives of Trigonometric Functions<br>**Exam 1** (Covers Vector Supplement through Section 2.8) | Sections 3.2-3.3 |
| *6* | The Chain Rule, Implicit Differentiation; Derivatives of Logarithmic Functions | Sections 3.4-3.6 |
| *7* | Derivatives of Vector Functions; Slopes and Tangents to Parametric Curves; Rates of Change in the Natural and Social Sciences; Exponential Growth and Decay | Supplement II, Sections 3.7-3.8 |
| *8* | Related Rates; Linear Approximations and Differentials | Sections 3.9-3.10 |
| *9* | Maximum and Minimum Values;<br>**Exam 2** (Covers 3.1 through 3.10) | Sections 4.1 |
| *10* | The Mean Value Theorem; How Derivatives Affect the Shape of a Graph; Indeterminate Forms and L'Hospital's Rule | Sections 4.2-4.4 |
| *11* | Indeterminate Forms and L'Hospital's Rule (continued); Optimization Problems; Antiderivatives | Sections 4.4, 4.7, 4.9 |
| *12* | Areas and Distances; The Definite Integral; The Fundamental Theorem of Calculus | Sections 5.1-5.3 |
| *13* | The Fundamental Theorem of Calculus (continued)<br>**Exam 3** (Covers 4.1 through 5.2); Thanksgiving Holiday | Section 5.3 |
| *14/15* | Indefinite Integrals and the Net Change Theorem; The Substitution Rule | Sections 5.4-5.5 |

**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

**ACADEMIC INTEGRITY**

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*

**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.