Course Information

Course Number:	Math 171 (Section 201 – this is the honors section)
Course Title:	**Honors Calculus I**
Time:	(Lecture) Tuesday/Thursday 9:35-10:50 and (Recitation) Wednesday 8:00-8:50
Location:	(Lecture) Blocker 148 and (Recitation) Blocker 122
Credit Hours:	4

Instructor Details

Instructor:	Prof. Anne Shiu
Office:	Blocker 601-E
E-Mail:	annejls@tamu.edu
Office Hours:	Mondays 1:15pm – 2:15 p.m. (except Labor Day & Fall Break)
	By appointment (ask one day in advance)

Course Description

Vectors, functions, limits, derivatives, Mean Value Theorem, applications of derivatives, integrals, Fundamental Theorem of Calculus. MATH 171 is designed to be more demanding than MATH 151. Only one of the following will satisfy the requirements for a degree: MATH 131, MATH 142, MATH 147, MATH 151, or MATH 171. *NOTE: This sentence does <u>not</u> mean that all the listed classes are equivalent to each other; it simply means that the overlap among these courses forbids than one from applying toward a student's degree. For example, Math 142 is NOT equivalent to Math 151 or Math 171 and cannot be used as a prerequisite for Math 152 or Math 172.*

Course Prerequisites

MATH 150 (or equivalent) or acceptable score (22 or higher) on TAMU Math Placement Exam for Math 147/151/171.
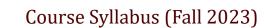
Course Schedule (tentative)

https://www.math.tamu.edu/courses/math171/171_weekly_schedule.pdf

Special Course Designation

This is a Core Curriculum course in Mathematics (as approved by the Texas Higher Education Coordinating Board). 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 experiences.

Course Learning Outcomes

Math 171 is the first of a three-semester beginning calculus sequence, which is taken, for the most part, by math, statistics, and physics majors. The department expects that students passing Math 171 be able to follow mathematical proofs and handle routine computations, i.e., limits, derivatives, max-min problems, and calculation of definite integrals using the fundamental theorem of calculus. We expect students to be able to state (write) and apply basic definitions and major theorems. These include, but are not limited to, definitions of limit, continuous function, derivative, definite and indefinite integrals,

the Intermediate Value Theorem for continuous functions, the Mean Value Theorem, and the Fundamental Theorem of Calculus.

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.
- State 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.

This course will meet the enhanced learning objectives of an honors course by the use of richer homework assignments, higher-level lectures, and oral examinations.

Core Objectives

Critical Thinking: *creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information.*

- 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: *effective development, interpretation and expression of ideas through written, oral, and visual communication.*

- 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 create a video recording in which they explain a mathematical topic.

Empirical and Quantitative Skills: *manipulation and analysis of numerical data or observable facts resulting in informed conclusions.*

- 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 the 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.

Textbook
Calculus: Early Transcendentals, by Stewart et al, published by Brooks/Cole, 8th edition

Websites
https://people.tamu.edu/~annejls/teaching/171-fall-23.html (Homework is posted here.)
Also, we will use www.piazza.com.

Student Expectations
Students are expected to read the textbook and complete homework. For exams, students will be expected to work with key mathematical concepts, write short proofs, and understand important definitions and statements of theorems.

Calculator Policy.
No calculators are allowed for exams.

Homework
Homework will be due most weeks on **Tuesday** at the beginning of class. *Staple your homework, and remove frayed edges from paper torn from spiral notebooks. Additionally, homework solutions must be clear and well-organized; the grader will impose a 10% penalty for solutions that are lacking in clarity.* Practice/challenge problems are optional and do not count toward your grade. Group work is encouraged, but please write up your solutions independently.

Late homework policy
Late homework is *not* accepted (except with a University-approved absence; see Make-up Policy below). However, the lowest two homework scores will be dropped.

Quizzes
On many **Thursdays**, quizzes will be given, usually covering the lectures from the previous week. The lowest quiz score will be dropped.

Exams

There will be two in-class midterms, two oral exams, and one final exam:
- Written midterm 1: Tuesday, September 26 (Week 6)
- Oral midterm 1: Monday, September 25 (Week 6) -- tentative – *by appointment!*
- Midterm 2: Tuesday, November 7 (Week 12)
- Oral midterm 2: Monday, November 6 (Week 12) -- tentative – *by appointment!*
- (Cumulative) final exam: Thursday, December 7 (10:00 – 12:00 noon)

Grading Policy

- Homework: 10% *(In at least one of these assignments, you will be asked to explain your reasoning in a written format [several sentences]. In at least one of these assignments, you will be asked to explain your reasoning in a video recording.)*
- Quizzes: 10%
- Recitation activities: 10% (The lowest two scores will be dropped.)
- Written midterm 1: 10%
- Written midterm 1: 10%
- Oral midterm 1: 10%
- Oral midterm 2: 10%
- Final exam: 20%
- Written-midterm corrections: 10%

Final grades: did you accomplish the learning outcomes?

- **A**: 80%+
- **B**: 70–89%
- **C**: 60–79%
- (no D grades, except in rare cases)
- **F**: < 60%

The precise cut-offs will be determined when final grades are assigned.

Attendance and Make-Up Policies

Attendance is essential if you wish to complete this course successfully.
- **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/quizzes or late homework/writing assignments 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 two business days* of the missed exam, quiz, or assignment to arrange a makeup.

Learning Support

The Texas A&M **Math Learning Center (MLC)** offers various forms of support for Math 171, both online and face-to-face, including drop-in Help Sessions, Tutoring by Appointment, Week-in-Review sessions and other activities.

Additionally, the MLC hosts an archive of Supplemental Material, such as Python tutorial videos and recorded review sessions. Help Session schedules will be posted here: http://mlc.tamu.edu/Online-Help-Services

Use of Generative-AI Technology

According to the Texas A&M University Definitions of Academic Misconduct, **plagiarism** is the appropriation of another person's ideas, processes, results or words without giving appropriate credit (aggiehonor.tamu.edu). *In this course, you must credit your use of anyone else's words, graphic images, or ideas (this mostly applies to homework).* Artificial Intelligence (AI) text generators and natural language processing tools (colloquially, chatbots - such as ChatGPT), audio, computer code, video, and image generators should not be used for any work for this class without explicit permission of the instructor and appropriate attribution (in this case, state what prompt(s) you provided the AI text generator). However, the use of such tools for simply checking spelling and grammar (without attribution) is acceptable (on homework).

Life
If your performance in the class is negatively affected by your experiences outside of class, please talk to me!

University Policies

Attendance Policy

The university views class attendance and participation as an individual student responsibility. Students are expected to attend class and to complete all assignments.

Please refer to Student Rule 7 in its entirety for information about excused absences, including definitions, and related documentation and timelines.

Makeup Work Policy

Students will be excused from attending class on the day of a graded activity or when attendance contributes to a student's grade, for the reasons stated in Student Rule 7, or other reason deemed appropriate by the instructor.

Please refer to Student Rule 7 in its entirety for information about makeup work, including definitions, and related documentation and timelines.

Absences related to Title IX of the Education Amendments of 1972 may necessitate a period of more than 30 days for make-up work, and the timeframe for make-up work should be agreed upon by the student and instructor" (Student Rule 7, Section 7.4.1).

"The instructor is under no obligation to provide an opportunity for the student to make up work missed because of an unexcused absence" (Student Rule 7, Section 7.4.2).

Students who request an excused absence are expected to uphold the Aggie Honor Code and Student Conduct Code. (See Student Rule 24.)

Academic Integrity Statement and Policy

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

"Texas A&M University students are responsible for authenticating all work submitted to an instructor. If asked, students must be able to produce proof that the item submitted is indeed the work of that student. Students must keep appropriate records at all times. The inability to authenticate one's work, should the instructor request it, may be sufficient grounds to initiate an academic misconduct case" (Section 20.1.2.3, Student Rule 20).

You can learn more about the Aggie Honor System Office Rules and Procedures, academic integrity, and your rights and responsibilities at aggiehonor.tamu.edu.

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 or a solutions manual* and turn it in as your own. Any student found guilty of cheating, plagiarism, or other dishonorable acts in academic work is subject to disciplinary action. If you are caught cheating, you will receive a grade of "0" and it could result in your failing the course.

Americans with Disabilities Act (ADA) Policy

Texas A&M University is committed to providing equitable access to learning opportunities for all students. If you experience barriers to your education due to a disability or think you may have a disability, please contact Disability Resources in the Student Services Building or at (979) 845-1637 or visit disability.tamu.edu. Disabilities may include, but are not limited to attentional, learning, mental health, sensory, physical, or chronic health conditions. All students are encouraged to discuss their disability related needs with Disability Resources and their instructors as soon as possible.

Title IX and Statement on Limits to Confidentiality

Texas A&M University is committed to fostering a learning environment that is safe and productive for all. University policies and federal and state laws prohibit gender-based discrimination and sexual harassment, including sexual assault, sexual exploitation, domestic violence, dating violence, and stalking.

With the exception of some medical and mental health providers, all university employees (including full and part-time faculty, staff, paid graduate assistants, student workers, etc.) are Mandatory Reporters and must report to the Title IX Office if the employee experiences, observes, or becomes aware of an incident that meets the following conditions (see University Rule 08.01.01.M1):

- The incident is reasonably believed to be discrimination or harassment.
- The incident is alleged to have been committed by or against a person who, at the time of the incident, was (1) a student enrolled at the University or (2) an employee of the University.

Mandatory Reporters must file a report regardless of how the information comes to their attention – including but not limited to face-to-face conversations, a written class assignment or paper, class discussion, email, text, or social media post. Although Mandatory Reporters must file a report, in most instances, you will be able to control how the report is handled, including whether or not to pursue a formal investigation. The University's goal is to make sure you are aware of the range of options available to you and to ensure access to the resources you need.

Students wishing to discuss concerns in a confidential setting are encouraged to make an appointment with Counseling and Psychological Services (CAPS).

Students can learn more about filing a report, accessing supportive resources, and navigating the Title IX investigation and resolution process on the University's Title IX webpage.

Statement on Mental Health and Wellness

Texas A&M University recognizes that mental health and wellness are critical factors that influence a student's academic success and overall wellbeing. Students are encouraged to engage in proper self-care by utilizing the resources and services available from Counseling & Psychological Services (CAPS). Students who need someone to talk to can call the TAMU Helpline (979-845-2700) from 4:00 p.m. to 8:00 a.m. weekdays and 24 hours on weekends. 24-hour emergency help is also available through the National Suicide Prevention Hotline (800-273-8255) or at suicidepreventionlifeline.org.