Calculus I, MA 125-CW

INSTRUCTOR

Joseph Casey

EMAIL

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OFFICE LOCATION

University Hall 4031

OFFICE HOURS

(In HHB 202)

Wed (8-10 AM)

COURSE OVERVIEW

Calculus I is the foundation for higher level mathematics, but also for having any sort of basis to understand the physical laws of the universe. The universe is dynamic, and Calculus is about studying change, and determining how much change can occur on an infinitesimal level. A good understanding of Calculus will allow students to interpret predictive models for finance, projectile motion, disease spread, and many other applications. We will begin the course with a short review of essential functions, and functions characteristics (zeros, increasing/decreasing, positive/negative, turning points, etc.). We will continue with limits, quickly building up to derivatives. We will cover a wide array of formulas for calculating derivatives. In Unit 3 we will study area under a function's curve, and relate that to derivatives through the Fundamental Theorem of Calculus.

REQUIRED TEXT

Thomas' Calculus, 15th Edition, Joel Hass, Christopher Heil, Przemyslaw Bogacki, Maurice D. Weir
E-Book Comes with UAB First Day Access Through Pearson MyMathLab (you do not need the hard copy)

EXAM SCHEDULE

DATE(S)	SUBJECT
2/10-2/14	Exam 1 (Lectures 1-8)
3/24-3/28	Exam 2 (Lectures 9 -15)
4/21-4/25	Exam 3 (Lectures 16-21)
4/30 @ 1:30 pm	Final Exam (Lectures 1-21) – 2 hours 30 minutes,

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GRADING SCHEME

ASSIGNMENT TYPE	PERCENTAGE	DESCRIPTION
Midterm Exams (Three)	36%	3 midterm exams, 12% each
Final Exam	24%	Final Exam on the Wednesday of Exam Week, 12/11
Weekly Quizzes	20%	Take home quizzes are submitted each week. They are not accepted late
MyLab Mastering Homework	10%	22 Webassign Homework Assignments, 0.5 points each
Participation	10%	This includes completion of lab assignments, iClicker assignments, and attendance at lab and lecture

GRADING SCALE

A: 88% and higher	B: 75% - 87%	C: 62% - 74%	D: 50% - 61%	F: 49% and lower

MYLAB MASTERING "HOMEWORK"

There is one MyLabMastering assignment per lecture. We will complete a third of each assignment during the corresponding lecture, then the rest you will complete on your own. You should bring a laptop or tablet to each lecture so that you can complete the assignment as part of the lecture.

The MyLab Mastering platform which is hosted by Pearson is made available through UAB First Day Access. Click here for more information: https://www.uab.edu/elearning/academic-technologies/first-day-access

FIRST DAY ACCESS PROGRAM

The First Day Program, hosted by the UAB Bookstore, allows students to receive their digital course materials directly in their Canvas course on the first day of class for a reduced cost. Students do not need to come to the bookstore to order anything for courses that participate in First Day Access. Charges for first day courses are billed directly to the students' account, with financial aid applied against those charges if appropriate. Follow this link for information on how to opt-out if you need to (you will still have to pay for your materials, but you will do it in a different, generally more expensive way) First Day Access (Course Materials) - The Office of Learning Technologies (uab.edu)

WEEKLY QUIZZES

Each week you will complete a take home quiz and submit it online the week after you learned the material. The take home quiz is due on the Sunday of each week and it **CANNOT BE SUBMITTED LATE FOR ANY REASON.** You will upload a **SINGLE** pdf of your work using the Pearson assignment tab called "Week ____ Take Home Quiz". If you submit more than one pdf, you will receive a 1 point deduction for not following directions (and creating more work for the person grading your quiz).

MIDTERM EXAMS

There will be 3 midterm exams throughout the semester (each exam will be part multiple-choice and part free-response), one at the end of each unit (see course schedule for dates). The final exam will be cumulative. Each midterm exam is worth 12% and the final exam is worth 24%.

FRQ: You will complete the Free Response portion during the large lecture class. There is no make up for this. If you miss this for any reason, you will receive a zero. However, if you have an emergency, you can replace one of your midterms with the final exam score, you will simply need to submit a form near the end of the semester letting your instructor know which score you want replaced. Your score will be calculated as a zero for that midterm until after the final exam, when your score will be replaced with the relevant sub-score from the final exam.

LAB CLASS PARTICIPATION

Attendance at all lab classes is mandatory, and you will lose points if you do not attend class. During lab class, you will earn one point for attending class (and signing in), and one point for answering a "flashcard question", which is a question your GTA will ask you from a notecard. That is a base of 2 points per lab class. You can earn up to 2 bonus points per lab class. If you miss a lab class, you must attend your GTA's office hours in the Math Learning Lab (HHB 202) to complete make up flashcard questions. (The score for the missed lab will still be recorded as a 0 until you complete make up flashcards. You can earn **BONUS** for each lab class by answering two extra flashcard questions correctly. If you miss class, you cannot receive bonus points.

TEST CORRECTIONS/EXTRA CREDIT

There will be NO test corrections on the exams. However, if you miss a midterm exam or get a very low score, you can submit a form near the end of the semester and request that your low score midterm be replaced with your sub-score from the final exam corresponding to the material from that unit.

MAKE UP WORK

If you miss an assignment, you must make it up in a timely manner. (**This does not include quizzes or midterms, which you cannot make up**)

- Anything from Unit 1 must be made up on or before Sunday, 2/16/25 at 11:59 pm. No credit will be given for Unit 1 material after this point. This means make ups for lab participation must be completed before your GTA's last office hour during this week.
- Anything from Unit 2 must be made up on or before Sunday, 3/30/25 at 11:59 pm. No credit will be given for Unit 2 material after this point. This means make ups for lab participation must be completed before your GTA's last office hour during this week.
- Anything from Unit 3 must be made up on or before Sunday, 4/27/25 at 11:59 pm. No credit will be given for Unit 3 material after this point. This means make ups for lab participation must be completed before your GTA's last office hour during this week.
- Grades will be submitted to the University at 5:00 pm on Friday 5/2/25

If you miss a lab class, your score for that lab class will be recorded as a 0 out of 2. However, you can attend your GTA's office hours in the math learning lab to make up those office hours.

If you miss a midterm, or part of a midterm, you can fill out a form at the end of the semester to have the score from your missed midterm be replaced with the sub-score on the related material from the final exam. (You can only do this for ONE midterm).

FINAL EXAM

The final exam will be cumulative and will draw questions from the three midterm exams. It will have 12 Multiple Choice Questions and 6 Free Response Questions (4 MC and 2 FR from Each Midterm). The Exam will take 2.5 hours and will be held on Wednesday, 4/30/25, 1:30-4:00 pm in a location that will be announced later.

ACCOMODATIONS FOR STUDENTS WITH DISABILITIES

If you are a student with learning needs that require special accommodation: Register with UAB's Disability Support Services (https://www.uab.edu/students/disability/) by providing appropriate documentation. Then: Email your instructor (lwickman@uab.edu) your accommodation letter, along with any additional information. Finally, register for the exams through the DSS (if you get extended time) to ensure testing accommodations are met.

This should be done as early as possible in the semester. However, you can submit your accommodation letter to the instructor at any point in the semester.

ACADMEIC INTEGRITY

UAB students are bound by the Academic Integrity Code, which can be found here: https://www.uab.edu/one-stop/images/documents/academic-integrity.pdf. Instances of cheating will be dealt with according to the code.

CAMPUS RESOURCES

There are many counseling and wellness programs available to you as a UAB student. If you or a friend is in distress, please visit https://www.uab.edu/students/counseling/resources/campus-resources for a list of available resources and reach out for help.

EXTRA HELP

There are many opportunities available for extra help. One of the most useful is the Math Learning Lab. You can attend without an appointment and get help with any math class (up to Calculus 2). Learning Lab information can be found at this link: https://www.uab.edu/cas/mathematics/student-resources/math-learning-lab

LEARNING OBJECTIVES

By the end of this course, students will be able to:

1. Evaluate a limit with numerical approximation, with a graph, and with algebraic methods.
2. Analyze a limit and determine which method (numerical, graphical, or algebraic) is the best for evaluation.
3. Use limits to determine a function's end behavior.
4. Determine the continuity intervals of a function
5. Classify a function's discontinuities.
6. Apply the Intermediate Value Theorem to find an interval that contains a zero or a given output of a function.
7. Determine if the Intermediate Value Theorem applies to a certain scenario.
8. Find the average rate of change of a continuous function on a closed interval.
9. Compute a derivative of a polynomial, a simple radical, or a rational expression using the limit definition of derivative.
10. Compute a derivative of a power expression with the power rule.
11. State the derivative of $f(x) = \sin x$ and $f(x) = \cos x$
12. Apply the linearity of differentiation to compute the derivative of a polynomial.
13. Compute the derivative of a product with the product rule.
14. Compute the derivative of a quotient with the quotient rule.
15. Compute the derivative of $f(x) = \tan x$, $f(x) = \cot x$, $f(x) = \sec x$, $f(x) = \csc x$ using the quotient rule.
16. Compute the derivative of a compound function using the chain rule.
17. Apply the Mean Value Theorem on an interval of a continuous function and find points where the derivative equals the average rate of change.
18. Use differentiation to determine where a function is increasing and decreasing.
19. Apply the First Derivative Test to identify turning points of a function.
20. Apply the Extreme Value Theorem to find the absolute maximum and absolute minimum values of a function on a closed interval.
21. Use differentiation to determine where a function is concave up and/ concave down.
22. Apply the Second Derivative Test to identify relative extrema of a function.
23. Apply Newton's Method to approximate the zeros of a function.
24. Use Calculus methods in optimization problems including:
    a. Minimize surface area of a box or cylinder.
    b. Maximize volume of a box
    c. Maximize area of a rectangular field/space
    d. Minimize distance between a point and graph in the xy-plane
25. Compute an antiderivative of a polynomial using the "Reverse Power Rule" and the linearity of differentiation
26. Use area formulas for a rectangle and triangle to compute "area under a curve"
27. Compute a left, right, and midpoint Riemann sum with 3 to 8 rectangles
28. Compute a right Riemann sum with an arbitrary n rectangles.
29. Write a definite integral to represent the limit of a Riemann sum.
30. Apply properties of definition integrals such as:
    a. $\int_a^a f(x)dx = 0$
    b. $\int_a^b f(x)dx = -\int_b^a f(x)dx$
    c. $\int_a^b f(x)dx = \int_a^c f(x)dx + \int_c^b f(x)dx$
31. Evaluate a definite integral with the Fundamental Theorem of Calculus
32. Evaluate an accumulation of area function
33. Differentiate an accumulation function using the Fundamental Theorem of Calculus

34. Evaluate an indefinite integral
35. Use u-substitution to evaluate an indefinite integral
36. Determine a function has an inverse
37. Find a function's inverse, or observe that it is impossible to find the function's inverse explicitly
38. Evaluate the derivative of an inverse function at a given $x = a$, even if the inverse cannot be compute explicitly
39. Differentiate natural logarithm functions and exponential functions
40. Integrate exponential functions
41. Integrate functions of the form: $\int u^{-1} du$

LECTURE BREAKDOWN

Lecture Number	Lecture Subject	Corresponding Textbook Section(s)
Exam 1 – Lectures 1-8 (Midterm Dates: 2/10-2/14)		
1	Review of Function Essentials	1.1-1.4
2	Intro to Limits	2.2 & 2.4
3	Algebraic Methods to Evaluate a Limit & Continuity	2.2 & 2.5
4	Infinity & End Behavior	2.6
5	Tangent Lines & Derivatives	3.1 & 3.2
6	Basic Derivative Rules	3.3 & 3.5
7	Product & Quotient Rules	3.3
8	Chain Rule	3.6
Exam 2 – Lectures 9-15 (Midterm Dates: 3/24-3/28)		
9	Implicit Differentiation	3.7
10	Linearization & Horizontal Tangent Lines	3.9

11	Newton's Method, Finding Zeros	4.6
12	First Derivative Test & Extrema	4.1 & 4.3
13	Concavity & Second Derivative Test	4.2 & 4.4
14	Optimization Problems	4.5
15	Antiderivatives	4.7
Exam 3 – Lectures 16-21 (Midterm Dates: 4/21-4/25**)**		
16	The Substitution Method	5.5
17	Area Under the Curve	5.1
18	Sigma Notation & Definite Integrals	5.2 & 5.3
19	Fundamental Theorem of Calculus	5.4
20	Logarithmic Functions & Accumulation Under 1/x	7.2
21	Exponentials & Inverse Functions	7.1 & 7.3