Calculus I, MA 125, Section OE

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| Instructor Mrigank Mrigank Email [mrigank@uab.edu](mailto:mrigank@uab.edu) Office location University Hall 4013 Office Hours By Appointment MLL Hours | 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 textStewart, James. *Essential Calculus*, Cengage Learning. 2nd edition (2013). E-Book Comes with UAB Opt-In Through Webassign (you do not need the hard copy)Required Materials Computer with strong internet access.  Printer with ink (or tablet). PDF’s of the notes must be either printed or downloaded and completed, then turned in on our e-learning website. Exam schedule  |  |  | | --- | --- | | Date(S) | Subject | | 6/17-6/21 | Midterm 1 (Lectures 1-8) – 1 hour 30 minutes | |  |  | | 7/8-7/12 | Midterm 2 (Lectures 9 -15) – 1 hour 30 minutes | |  |  | | 7/29-8/2 | Midterm 3 (Lectures 16-22) – 1 hour 30 minutes | |  |  | | 8/5-8/8 | Final Exam (Lectures 1-22) – 2 hours 30 minutes, Location TBD |   . |

# Grading Scheme

# This is an approximation of the points breakdown for the course. There will be 100 available points altogether in the course (not including any extra credit), though this number may change if circumstance requires the deletion of any assignments.

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| --- | --- | --- |
| Assignment Type | Total Points | Description |
| Midterm Exams (Three) | 36 | 3 midterm exams, 12 points each, see exam schedule above. Students may bring a reference sheet, one 8.5x11” sheet. |
| Final Exam | 15 | Final Exam on the Wednesday of Exam Week, 4/24  Students may bring a reference sheet, one 8.5x11” sheet. |
| Weekly Quizzes | 22 | 6 Take Home Quizzes, 1 point per lecture  **These may NOT be submitted late** |
| Weekly Lab Worksheets | 2.2 | 6 Worksheets, 0.1 points per lecture |
| 3 Problem Presentations | 9 | 3 points each, one presentation per unit |
| Lecture Notes | 2.2 | 22 Lecture Notes, Download the pdfs on a tablet or print them and scan and submit them when finished, 0.1 points each |
| Webassign Homework | 11 | 22 Webassign Homework Assignments, 0.5 points each |
| Lecture Warm-Ups (Attendance) | 2.2 | 22 Lecture Warm-Ups, 0.1 points per lecture |
| Derivative Drills & Interal Drills | 0.4 | 0.2 points per attendance assignment |

# Grading Scale

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| --- | --- | --- | --- | --- |
| A: 90% and higher (89.5 will round up) | B: 80%-89.4%  (79.5% will round up) | C: 70%-79.4% (69.5% will round up) | D: 60%-69.4% (59.5% will round up) | F: 59.4% and lower |

# Webassign Homework

There is one webassign homework corresponding to each section of the notes. The assignment is designed to take between 1-2 hours to complete altogether. Please TRY THE PROBLEM YOURSELF before seeking help. See this link for more information on UAB First Day Access: <https://www.uab.edu/elearning/academic-technologies/first-day-access>

# Weekly Quizzes

# Starting in Week 2, there will be a quiz nearly each week covering the material from the previous week. The quiz will take about an hour to complete. The quiz material will be drawn from the lab worksheet covered in the previous week. The quizzes will be posted early so you can submit it early if you would like. However, you CANNOT submit a quiz late. The solutions are set to automatically appear at midnight when the quiz is due, so if you submit it even two minutes late, we’ll have to assume you were able to copy the answers. DO NOT WAIT UNTIL THE LAST DAY FOR THESE.

# Weekly Lab Worksheets

Each week there will be a worksheet to complete by hand (either printing it out to complete it on paper, or downloading and completing it on a tablet). Scan and submit the worksheet by the end of the week. The quiz the following week will be based on this worksheet.

# Midterm Exams & Final Exam

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 15%. You may use any calculator without internet connection on the exam and you may bring a reference sheet: a single 8.5x11” sheet with any formulas you wish to know. The midterms and the final will be scheduled through ProctorU and you will take the exam at home in a silent location.

# Test Corrections/Extra Credit

# There will be NO test corrections on the exams, however, on Midterm Exams 1-3, there will be a long extra credit Webassign review which you can complete until the Sunday of the exam week in order to add a maximum of 10% to your exam grade. (The Webassign assignment will say it is out of 120 points, whatever you earn on it, multiply that amount by 0.01 and that will be added to your exam score, note a max of 1.2 points may be added to your exam).

# Make Up Work/ Late Work

QUIZZES cannot be made up or submitted late for any reason. They will be posted early and you will have over a week after the time you learned the material to complete the quiz. The solutions to the quiz will be posted automatically at the time the quiz is due so late quizzes will not be accepted for ANY reason (including illness or death of a family member).

* Any late Lectures Notes, Webassign Homework, or Lab Assignments from Unit 1 must be made up on or before **6/23/24.** No credit will be given for past due Unit 1 material after this point for any reason (including illness or death of a family member).
* Any late Lectures Notes, Webassign Homework, or Lab Assignments from Unit 2 must be made up on or before **7/14/24**. No credit will be given for past due Unit 2 material after this point for any reason (including illness or death of a family member).
* Any late Lectures Notes, Webassign Homework, or Lab Assignments from Unit 3 must be made up on or before **8/4/24**. No credit will be given for past due Unit 3 material after this point for any reason (including illness or death of a family member).

MIDTERMS need to be completed during their assigned window. If something goes wrong (technical difficulties or scheduling problems) during that window, you will have one opportunity to complete the exam in person. (Friday 6/21 at 2:30 pm for Midterm 1, Friday 7/12 at 2:30 pm for Midterm 2, Friday 8/2 at 2:30 pm for Midterm 3, or Thursday 8/8 at 2:30 pm for the Final Exam).

# Lecture Notes

In order to ensure lecture watching, students will submit a copy of their filled-in notes from each lecture (written in THEIR OWN HANDWRITING with their **name signed at the top**. Students may either download the guided notes onto a tablet, or they may print them and fill them out that way (as long as the writing is done IN THEIR OWN HANDWRITING and then submitted on canvas afterward). For students who choose to print the notes, use an app such as CamScanner to take a picture of the notes and convert them to pdfs. Then upload them on canvas.

# Problem Presenations

Each unit, students will be required to create a multiple-choice problem based on material in that unit. The problem must have 5 answer choices. Students will then present their problem and solution in five minutes or less (**ONLINE** sections will submit a video presentation, **IN-PERSON** sections will present in class while the other students in the class write down the problems from the day and submit their work for a completion grade).

# Attendance

**ONLINE:** There is no attendance requirement for the online section (QL), however you must complete the Lecture warm-up for each lecture, which will be the attendance grade for the in-person sections.

**IN-PERSON:** Attendance is required. We will track attendance with the Lecture Warm-Ups (which have a code you have to enter before completing the warm-up). If you miss a lecture and want to get credit for it, you must attend your instructor’s office hours. Each missed lecture = one office hour attendance for the make up. During the office hour, you will answer a question on a notecard (a derivative drill or something else from the course) and then you will be given the code for the Lecture Warm-Up to complete at home in order to get credit for that day’s attendance.

# 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 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. Ideally you should also meet with your instructor in person to ensure your accommodations are being met in a satisfactory way.

# 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:

Consequences for cheating:

* If you are found to be cheating on a midterm or a final exam, you will receive a 0 on the entire assignment with no chance for a make-up. (Examples of cheating on a midterm/final: using a phone or unauthorized device during the exam or looking at somebody else’s work, using a website that solves the problem for you or tells you the answer, or anything that entails not solving the problem yourself).
* If you are found to be cheating on a quiz you will receive a 0 on the entire assignment. (Examples of cheating on the quiz: your work is exactly the same as somebody else’s or you’ve submitted answers with no accompanying work. If your work is exactly the same as somebody else’s, please be aware that both parties will receive a 0, not just the copier).
* If you are found to be cheating on an online submission (lecture notes, lab assignments etc.) you will receive a 0 on that assignment with no chance for a make-up (Example of cheating on an online submission: you’ve submitted somebody else’s work instead of your own)

For the first cheating offense, you will be notified of your 0 grade on the assignment with an e-mail or assignment comment in canvas. If you are found to be cheating more than once, we will follow the Academic Integrity Code outline in the document above and submit the case for review by the Dean’s Office for the College of Arts and Sciences, generally resulting in a suspension from the university.

# 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>

# Course 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 and
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 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:
    1. Minimize surface area of a box or cylinder.
    2. Maximize volume of a box
    3. Maximize area of a rectangular field/space
    4. Minimize distance between a point and graph in the -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 rectangles.
29. Write a definite integral to represent the limit of a Riemann sum.
30. Apply properties of definition integrals such as:
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 -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 , 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: