

# M 408C: Differential and Integral Calculus

*The University of Texas at Austin, Fall 2024*

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**Registrar Information:** Unique # 53290 and # 53295, QR flag, Core MA

**Lectures:** TueThu 12:30-2pm in JGB 2.216. Aug 27 – Dec 5, with Nov 26 and 28 off.

**Discussion Sections:** MonWed in CPE 2.210. Aug 28 – Dec 9, with Sept 2, Nov 25 and 27 off.  
For # 53290, 2-3pm. For # 53295, 3-4pm.

**Canvas Webpage:** <https://utexas.instructure.com/courses/1396107>

**Instructor:** Joe Kileel, [jkileel@math.utexas.edu](mailto:jkileel@math.utexas.edu)

**Office Hours:** TueThu 2:15-3:15pm in POB 3.434 (For math questions, office hours are better than email.)

**Teaching Assistant:** Mina Haghighat Parast, [mina.hparast@utexas.edu](mailto:mina.hparast@utexas.edu)

**Office Hours:** MonWed 12:15-1:45pm in PMA 11.104

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**Course Description:** M 408C is the standard first-semester calculus course. It is directed toward students in the natural sciences and engineering. Its emphasis is on problem-solving and computation, not the theory of analysis. Students should gain some understanding of analysis, but the majority of proofs in the textbook will not be covered in class. The topics for M 408C include many of the basic issues in the theory of functions of a real variable: algebraic, trigonometric, logarithmic and exponential functions and their limits, continuity, derivatives, maxima and minima, graph sketching, integration, area under a curve, and volumes of revolution.

**Prerequisites:** Appropriate score on the mathematics placement exam or M 305G with a grade of at least B-.

**Required Textbook:** James Stewart, *Calculus: Early Transcendentals, 9th Edition* (see below for statement on textbook access)

**General Course Goals:** M 408C is primarily for people who will use calculus in their profession. Therefore our course goals focus on professionalism:

- Learning technical skills;
- Studying: taking and reviewing notes;
- Working with other people toward a common goal;
- Applying quantitative reasoning to real-world problems.

**Homework:** There will be 11 homework assignments, generally due on Mondays at 11:59pm (except Labor Day, the Mondays just after midterms and during Fall Break). Homework is assigned and turned in using Quest (<https://quest.cns.utexas.edu/>). Your lowest 3 homework scores will be dropped; therefore, no late or makeup homeworks will be accepted. It is permitted for students to discuss homework together. However, each of you must independently submit your own homework answers.

**Exams:** There will be three 75-minute midterms in-class starting at 12:30pm in JGB 2.216, tentatively on September 19, October 17 and November 14. There are no makeup midterms; however, the lowest of your 3 midterm scores will be dropped. There is a cumulative final, tentatively on December 12 at 1-3pm in GAR 102. There is no makeup final. No books, notes, or calculators may be used during the exams.

**Final Grade:** In determining letter grades, your scores will be weighted as follows:

homework	midterms	final
20%	50%	30%

Thus since you have 3 homework drops and 1 midterm drop, each counted homework and midterm is worth 2.5% and 25% respectively. After rounding your weighted total out of 100 to the nearest integer, final letter grade cut-offs will be the following:

100-92	91-90	89-86	85-82	81-80	79-76	75-72	71-70	69-66
A	A-	B+	B	B-	C+	C	C-	D+
65-62	61-60	59-0						
D	D-	F						

**Drop Deadlines:** The last day to drop the course without permission is September 11. The last day to drop it for academic reasons is November 20. After this, students may go to the Dean's Office to request a drop for urgent non-academic reasons.

**Lectures vs. Discussion Sections:** You are encouraged to attend the full-class lectures on Tuesdays and Thursdays, in addition to your assigned discussion sections on Mondays and Wednesdays. In lectures, I will present the main conceptual ideas and work some representative problems and computations. In discussion sections, you will have the opportunity to ask the teaching assistant more questions about the material and homework. You can also practice problem solving by working on problems not found in the homework. These problems may sometimes be more challenging than the HW; they can inspire discussion amongst the students and TA.

**Canvas:** Our course webpage will be housed on Canvas. Many important class announcements and course materials will be posted there. Course materials will include problem sets for discussion sections and optional introductory pre-recorded videos that you're invited to watch before lectures. Please monitor Canvas regularly.

**Textbook Access:** The textbook materials for this class are available through the Longhorn Textbook Access (LTA) program, a new initiative between UT Austin, The University Co-op and textbook publishers to significantly reduce the cost of digital course materials for students. You are automatically opted into the program but can easily opt-out (and back in) via Canvas through the 12th class day. If you remain opted-in at the end of the 12th class day you will receive a bill through your What I Owe page and *have until the end of the 18th class day to pay and retain access*. If you do not pay by the 18th class day, you will lose access to the materials after the 20th class day and your charge will be removed. More information about the LTA program is available at <https://www.universitycoop.com/longhorn-textbook-access>.

**Quest:** Homework assignments for this course will be generated via Quest from a data bank of questions developed specifically for the course. These questions are based, for most part, on ones in the text. Each question in the bank is an algorithm that produces many different versions of the same question, so is ideally adapted to producing individualized homework assignments and exams. Quest also gives you immediate feedback: after you submit your homework, your answers are graded as correct or incorrect, and individualized solutions become available. *Quest requires a \$25 charge per student for its use*. After the 12th day of class, when you log into Quest you will be asked to pay via credit card on a secure payment site. You have the option to wait up to 30 days to pay while still continuing to use Quest for your assignments. If you are taking more than one course using Quest, you will not be charged more than \$50/semester. Quest provides mandatory instructional material for this course, as does our text. For payment questions, please email [quest.fees@cns.utexas.edu](mailto:quest.fees@cns.utexas.edu).

**Further Educational Resources:** Consider using additional resources which are at your disposal to do your best in this course.

- **CalcLab:** <https://www.ma.utexas.edu/academics/undergraduate/calclab>  
“CalcLab is a place for students enrolled in calculus courses at UT to work with classmates and receive help on calculus problems. CalcLab is run by the Mathematics department, and is staffed with current calculus teaching assistants, as well as advanced undergraduate learning assistants.” This fall, CalcLab opens Tuesday, September 3 in PMA 8.136 and will keep the hours of Monday – Thursday 2-7pm and Friday 2pm-5pm. CalcLab learning modules for M 408C are at <https://web.ma.utexas.edu/users/m408n/m408c/CurrentWeb/>
- **Sanger Learning Center:** <https://undergradcollege.utexas.edu/slc>  
“Sanger Learning Center provides academic support for all UT Austin students. Each year, we help more than 11,000 students achieve their academic potential with our free services.” SLC offers ways to improve math skills by providing Math Refreshers & Reviews (MRRs) and several forms of tutoring.
- **Computer Lab:** There is an undergraduate computer lab in PMA 7.122, and it is open to all students enrolled in Math courses. Students can sign up for an

individual account themselves in the computer lab using their UT EID. The lab computers could be used to complete the Quest homework assignments.

**Services and Support:** UT Austin offers special services to further support students.

- Students with Disabilities: UT is committed to creating an accessible and inclusive learning environment consistent with university policy and federal and state law. If you are a student with a disability, or think you may have a disability, and need accommodations please contact Disability and Access (D&A) <http://diversity.utexas.edu/disability/>. If you are already registered with D&A, deliver your Accommodation Letter to me as early as possible in the semester. Students with disabilities need to make arrangements with the instructor or the Campus Testing Center (<https://testingservices.utexas.edu/campus-testing-center>) 2 weeks in advance of each exam, else the accommodations are forfeited.
- Religious Holidays: Students who need accommodations due to a religious holiday must make arrangements with me at least 2 weeks in advance.
- Dean of Students: The Office of the Dean of Students is committed to helping students reach their potential. If there are circumstances or emergencies making it impossible for you to be successful, consider contacting the Dean of Students and the Student Emergency Services: <https://deanofstudents.utexas.edu> and <https://deanofstudents.utexas.edu/emergency/>.
- Counseling and Mental Health Center: This provides support through assessment and referral, group and individual counseling, psychiatry and well-being services to the students of UT Austin: <https://www.cmhc.utexas.edu>.
- Recordings: Lectures and discussion sections will not be recorded.

**Flag Statement:** M 408C carries the Quantitative Reasoning (QR) flag. QR courses are designed to equip you with skills that are necessary for understanding the types of quantitative arguments you will regularly encounter in your adult and professional life. You should expect a portion of your grade to come from your use of quantitative skills to analyze real-world problems. This course may be used to fulfill the math component of the university core curriculum and addresses the following three core objectives established by the Texas Higher Education Coordinating Board: communication skills, critical thinking skills, and empirical and quantitative skills.

**Student Honor Code:** "I pledge, as a member of the University of Texas community, to do my work honestly, respectfully, and through the intentional pursuit of learning and scholarship." The Institutional Rules on Student Services and Activities, Chapter 11 provides detailed descriptions of conduct and academic integrity standards: <https://deanofstudents.utexas.edu/conduct/standardsofconduct.php>.

**Tentative Lecture Plan:** We plan to study parts of Chapters 1-6 of Stewart's book.

<i>Day</i>	<i>Date</i>	<i>Topic</i>	<i>Reading</i>	<i>Notes</i>
Tu	Aug 27	introduction; generalities on functions	1.1, 1.2, 1.3	
Th	Aug 29	exponentials; inverse functions; logarithms	1.4, 1.5	
Tu	Sept 3	intuition from tangents and velocities; limits	2.1, 2.2	<b>HW 1</b> due that night
Th	Sept 5	limit laws	2.3	
Tu	Sept 10	continuity; horizontal asymptotes	2.5, 2.6	<b>HW 2</b> due night before
Th	Sept 12	derivatives and rates of change	2.7	Sept 11 drop deadline
Tu	Sept 17	derivative as a function; midterm review	2.8	<b>HW 3</b> due night before
Th	Sept 19	<b>MIDTERM 1</b>		
Tu	Sept 24	derivatives of polynomial and exponential functions; product rule	3.1, 3.2	
Th	Sept 26	quotient rule; derivatives of trig functions	3.2, 3.3	
Tu	Oct 1	chain rule	3.4	<b>HW 4</b> due night before
Th	Oct 3	implicit differentiation; derivatives of log and inverse trig functions	3.5, 3.6	
Tu	Oct 8	rates of change in science; exponential growth and decay	3.7, 3.8	<b>HW 5</b> due night before
Th	Oct 10	related rates problems; linear approximation	3.9, 3.10	
Tu	Oct 15	hyperbolic functions and their derivatives; midterm review	3.11	<b>HW 6</b> due night before
Th	Oct 17	<b>MIDTERM 2</b>		
Tu	Oct 22	maximum and minimum values	4.1	
Th	Oct 24	mean value theorem; how derivatives affect the shape of a graph	4.2, 4.3	guest lecturer
Tu	Oct 29	how derivatives affect the shape of a graph	4.3	<b>HW 7</b> due night before
Th	Oct 31	indeterminate forms and l'Hospital's rule; curve sketching summary	4.4, 4.5	
Tu	Nov 5	optimization problems; antiderivatives	4.7, 4.9	<b>HW 8</b> due night before
Th	Nov 7	areas and distances; definite integrals	5.1, 5.2	
Tu	Nov 12	fundamental theorem of calculus; midterm review	5.3	<b>HW 9</b> due night before
Th	Nov 14	<b>MIDTERM 3</b>		
Tu	Nov 19	indefinite integrals and net change theorem	5.4	Nov 20 Q-drop deadline
Th	Nov 21	substitution rule	5.5	
Tu	Nov 26	<b>FALL BREAK</b>		
Th	Nov 28	<b>FALL BREAK</b>		
Tu	Dec 3	areas between curves; volumes	6.1, 6.2	<b>HW 10</b> due night before
Th	Dec 5	volumes; volumes by cylindrical shells; final review	6.2, 6.3	
Th	Dec 12	<b>FINAL EXAM</b>		<b>HW 11</b> due Dec 9 night

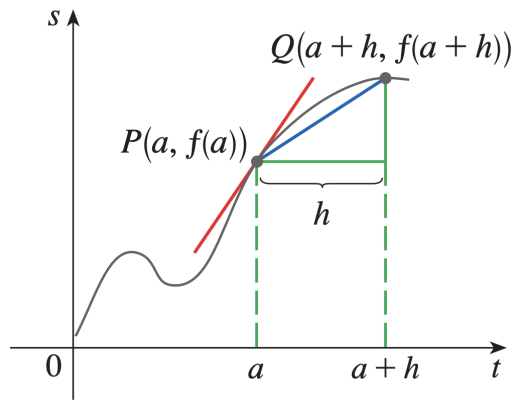


Figure 1: Illustration of the derivative as the limiting slope of secant lines to the graph of a function. For example, derivatives model instantaneous velocities in our everyday lives. This course will develop **differential calculus** and some of its useful applications. *Image credit: Stewart, 9th edition, page 143.*

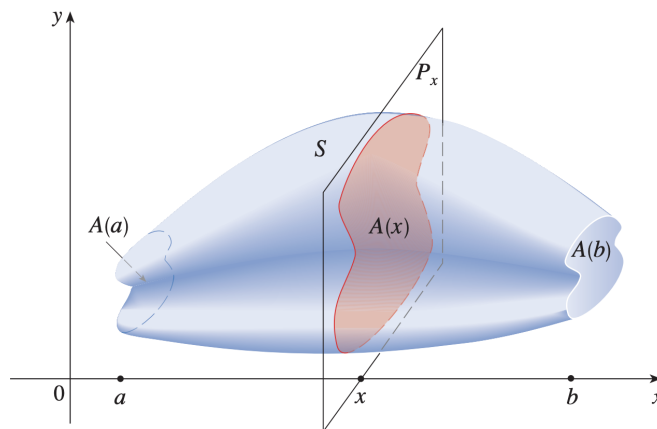


Figure 2: Illustration of computing a volume by adding up infinitesimal contributions from different slices. **Integral calculus** formalizes such processes. Among others, integration lets you calculate volumes and areas that stretched the likes of Archimedes in the past. *Image credit: Stewart, 9th edition, page 447.*