M 408C: Differential & Integral Calculus

The University of Texas at Austin, Spring 2025

Registrar Information: Unique # 53745 and # 53750, QR flag, Core MA

Lectures: TueThu 2-3:30pm in PMA 4.102. Jan 14 – Apr 24, with Mar 18 and 20 off.

Discussion Sections: MonWed in CPE 2.206, Jan 13 – Apr 28, with Jan 20, Mar 17 and 19 off. For # 53745, 10-11am. For # 53750, 2-3pm.

Canvas Webpage: https://utexas.instructure.com/courses/1409931

Quest Webpage: https://quest.cns.utexas.edu/

Instructor: Joe Kileel, jkileel@math.utexas.edu

Office Hours: TueThu 12:30-1:30pm in POB 3.434 (For math questions, office hours are better than email.)

Teaching Assistant: Ela Polak, epolak@utexas.edu

Office Hours: MonFri 11:15am-12:45pm in PMA 9.136

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, however some of the 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 one 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)

Course Objectives: By the end of this course, students should be able to ...

- Compute the derivative of a wide class of standard functions using or combining differentiation rules as appropriate;

- Compute indefinite and definite integrals using basic integration rules, such as the Fundamental Theorem of Calculus and the Substitution rule;

- Apply differentiation rules to solve problems in mathematics, such as graph sketching by hand and single-variable optimization;

- Apply integration rules to solve problems in mathematics, such as computing areas between curves and volumes of solids;

- Interpret derivatives of mathematical functions as rates of change of varying quantities;

- Interpret integrals of mathematical functions as accumulated totals of varying quantities;

- Identify calculus operations that are relevant in real-world situations in science, engineering and business, such as in related rates problems.

Homework: There will be 11 homework assignments, generally due on Sundays at 11:59pm (except the Sundays before Martin Luther King, Jr. Day, just after midterms, and at the start of Spring Break). The homework will be assigned and turned in via 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 *strongly encouraged* for students to discuss and work on the homework problems together. That said, each of you must independently submit your own homework answers.

Group Quizzes: There will be 11 weekly group quizzes in discussion section, generally on Mondays (except for MLK, Jr. Day and during Spring Break). The quizzes will be on topics from the most recent completed homework, with the aim of solidifying that material. They will be done in groups of 2 or 3. The quizzes will be in-person but through Quest, so each student must bring an appropriate device with internet access to discussion section. Your lowest quiz score will be dropped.

Exams: Please think of exams as *opportunities:* you get the chance to demonstrate all the knowledge you have built up from the homework, group quizzes, lectures and discussion sections. Ours will mostly be modeled on prior homework assignments. There will be three 75-minute midterms in-class starting at 2pm in PMA 4.102, tentatively on February 6, March 6 and April 10. There are no makeup midterms; however, the lowest of your 3 midterm scores will be dropped. There is also a cumulative final, tentatively May 5, 10:30am-12:30pm at PMA 4.102. There is no makeup final. No books, notes, calculators or other electronics may be used during the exams.

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

homework	group quizzes	midterms	final
25%	20%	35%	20%

Thus since you have 3 homework drops, 1 quiz drop and 1 midterm drop, each counted homework, group quiz and midterm is worth 3.125%, 2% and 17.5% respectively. After rounding your weighted total out of 100 to the nearest integer according to the table above, final letter grade cut-offs will not be stricter than 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*

Extra Credit: This course does not offer extra credit. That said, the final letter grade cut-offs above *might* be relaxed after the final exam. This will be at the instructor's discretion.

Drop Deadlines: The last day to drop the course without permission is January 29. The last day to Q-drop it, withdraw, or change the class to pass/fail is April 16. The last day to, with the required approvals, request a non-academic Q-drop is April 28.

Lectures vs. Discussion Sections: In lectures, I will present the main conceptual ideas and work some representative problems and computations. In discussion sections, you will do weekly group quizzes on Mondays, and be able to discuss the upcoming homework assignment and ask the TA any other questions about the material on Wednesdays. Attending *both* lectures and discussion sections is important.

Canvas: Our course webpage will be housed on Canvas. Important class announcements and course materials will be posted there. Course materials will include optional introductory pre-recorded videos hosted through the Panopto Video app on Canvas, which you are invited to watch before or after the lectures. It is your responsibility to monitor Canvas regularly. (Remark: Please ignore the unique # that Canvas shows; it is likely to show # 53745 regardless of what your actual unique # is.)

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: Besides Canvas, Quest will house the other webpage of major importance for this course. All the assessment for this course will be generated via Quest from a data bank of questions developed specifically for the course. These questions are based primarily on questions in the textbook. 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, group quizzes and exams. You will find your homework assignments and group quizzes on Quest, and submit there too. Quest gives you immediate feedback: after you submit your homework or group quiz, 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. Please recognize that Quest provides mandatory instructional material for this course, as does our textbook. For payment questions, please email quest.fees@cns.utexas.edu. Throughout the semester, please verify your grades are recorded correctly on Quest.

Further Educational Resources: Consider using all of the resources at your disposal to do your best in the 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." CalcLab exists in PMA 8.136. In the recent past, CalcLab has kept the hours of Monday – Thursday 2-7pm and Friday 2pm-5pm. CalcLab learning modules for M 408C are found 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 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 lost.

- 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 will study parts of Chapters 1-6 in Stewart's text.

Day	Date	Topic	Reading	Notes
Tue	Jan 14	introduction; generalities on functions	1.1, 1.2, 1.3	
Thu	Jan 16	exponentials; inverse functions; logarithms	1.4, 1.5	**HW 1** due next Mon
Tue	Jan 21	intuition from tangents and velocities; limits	2.1, 2.2	**GQ 1** day after
Thu	Jan 23	limit laws	2.3	**HW 2** due next Sun
Tue	Jan 28	continuity; horizontal asymptotes	2.5, 2.6	**GQ 2** day before
Thu	Jan 30	derivatives and rates of change	2.7	Jan 29 drop deadline; **HW 3** due next Sun
Tue	Feb 4	derivative as a function; midterm review	2.8	**GQ 3** day before
Thu	Feb 6	**MIDTERM 1**		
Tue	Feb 11	derivatives of polynomial and exponential functions; product rule	3.1, 3.2	
Thu	Feb 13	quotient rule; derivatives of trig functions	3.2, 3.3	**HW 4** due next Sun
Tue	Feb 18	chain rule	3.4	**GQ 4** day before
Thu	Feb 20	implicit differentiation; derivatives of log	3.5, 3.6	**HW 5** due next Sun
Tue	Feb 25	rates of change in science; exponential	3.7, 3.8	**GQ 5** day before
Thu	Feb 27	related rates problems; linear approximation	3.9, 3.10	**HW 6** due next Sun
Tue	Mar 4	hyperbolic functions and their derivatives; midterm review	3.11	**GQ 6** day before
Thu	Mar 6	**MIDTERM 2**		
Tue	Mar 11	maximum and minimum values	4.1	
Thu	Mar 13	mean value theorem; how derivatives affect the shape of a graph	4.2, 4.3	
Tue	Mar 18	**SPRING BREAK**		
Thu	Mar 20	**SPRING BREAK**		**HW 7** due next Sun
Tue	Mar 25	how derivatives affect the shape of a graph	4.3	**GQ 7** day before
Thu	Mar 27	indeterminate forms and l'Hospital's rule; curve sketching summary	4.4, 4.5	**HW 8** due next Sun
Tue	Apr 1	optimization problems; antiderivatives	4.7, 4.9	**GQ 8** day before
Thu	Apr 3	areas and distances; definite integrals	5.1, 5.2	**HW 9** due Sun
Tue	Apr 8	fundamental theorem of calculus; midterm review	5.3	**GQ 9** day before
Thu	Apr 10	**MIDTERM 3**		
Tue	Apr 15	indefinite integrals and net change theorem	5.4	Apr 16 Q-drop deadline
Thu	Apr 17	substitution rule	5.5	**HW 10** due Sun
Tue	Apr 22	areas between curves; volumes	6.1, 6.2	**GQ 10** day before
Thu	Apr 24	volumes; volumes by cylindrical shells; final review	6.2, 6.3	**HW 11** due Sun
Mon	May 5	**FINAL EXAM**		**GQ 11** on Apr 28