

MATH 111 CALCULUS I

FALL 2018

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| Office Hours: | TuTh 2:00 – 5:00 | MW 4:15 – 5:45 |

Text Material: James Stewart, *Single Variable Calculus: Early Transcendentals, 7th Edition*; additional resources will be posted on Canvas.

Course Content: Mathematics 111 is the first semester of introductory calculus. Course content includes: limits; continuity; the derivative; differentiation of algebraic, trigonometric, and the natural logarithmic and exponential functions; applications of derivatives; anti-derivatives; the definite integral; simple integration by substitution; and applications of the definite integral. A calendar of topics is provided at the end of this syllabus.

Course Goals: Upon successful completion of Math 111 students will:

1. Evaluate limits and interpret the results in relation to the graph of a function.
2. Define the derivative and relate this definition to the graph of a function and to the concept of “rate of change.”
3. Give proofs of some of the basic theorems, those that require only elementary algebra, geometry, and induction.
4. Differentiate algebraic, trigonometric, logarithmic and exponential functions.
5. Apply the derivative to the graphs of functions, to optimization situations and to related rate problems.
6. Define the definite integral and its relationship to area and volume.
7. Evaluate definite and indefinite integrals using algebraic techniques and the method of substitution.
8. Write mathematics clearly and cogently.

In general, each student should be able to calculate derivatives, to evaluate limits and to evaluate integrals (both definite and indefinite). Students should be able to apply appropriately their calculations and evaluations. In addition, students should understand the concepts of limit, continuity, derivative, anti-derivative, and have a beginning understanding of proof. The primary purpose of this course is to provide a solid foundation for success in Mathematics 112.

Prerequisites: Mathematics 111 is a beginning course: no prior exposure to calculus is needed! However, an advanced understanding of pre-calculus concepts (including algebra, logarithms and exponents, and trigonometry) and skill in applying them is necessary to perform well in the course.

Honor Code: Oxford College is a community of scholars. As scholars, we are interested in pursuing truth and becoming more adept at our individual contribution to this pursuit. As a community, we have certain expectations of—and responsibilities to—each other in our scholarly endeavors. The Honor Code is the document detailing expected behaviors as members of this community, as well as the means by which these expectations are upheld; a copy of this document is available at <http://oxford.emory.edu/catalog/regulations/honor-code.html>.

Generally, if permission is not given in writing to use a certain resource—including collaboration with other people—then any use of that resource in the completion of an assignment constitutes a violation of the Honor Code. While completing in-class assignments, all personal papers and cell phones must be put away for the duration of the assessment. Students who have taken an exam, test, or quiz must not discuss the content or nature of the assessment until all students have completed the assignment. Any graded out-of-class assignments—including reflection problems and some quizzes—should be completed using only the resources explicitly permitted in that assignment’s written instructions. The guidelines listed here are not intended to be exhaustive; if you are uncertain about any aspect of how an assignment is to be completed, ask first!

Class Attendance: The student is responsible for the course material discussed in class; therefore, the student is expected to attend all classes. Generally, students who attend class on a regular basis perform better on assessments than those who elect to be absent occasionally. Students accumulating four or more absences will be referred to the associate dean of academic affairs. In addition to the regular class meetings, tests and gateway exams are scheduled for certain Tuesday and Thursday mornings, as indicated on the calendar included with this syllabus.

Homework: Students who thoughtfully engage with course material on a regular basis are more likely to demonstrate a high level of performance on tests and quizzes. A collection of suggested problems will be provided at most class meetings; each assignment should be completed before the next class. A homework assignment is not considered “complete” until the student is able to produce a full solution for each problem without any sort of assistance. The amount of time required to complete a homework assignment can vary from student to student, but mastering each assignment is the most important aspect of preparation for this course; it is worth investing the time necessary to do it! Any resource may be used in the completion of daily homework assignments.

Written Style: Thoughts are expressed through sentences, even in mathematics. Mathematical arguments will often use symbols to efficiently convey complex ideas, but these notions are still communicated through sentences. Note “ $1+1 = 2$ ” is a complete sentence: it has the subject “ $1+1$ ”, verb “ $=$ ”, and predicate “ 2 ”. It is important to clearly communicate solutions using appropriate mathematical symbols and complete sentences; pertinent work needs to be neat and orderly to be intelligible. Taking time to be neat while working problems often eliminates careless mistakes and allows the writer (and ultimately, the audience) to focus on the main concept at hand.

Absences: It is the student’s responsibility to notify the instructor as soon as possible in the event of an absence from an assessment. If an excused absence from a test is known in advance—such as those due to official school functions or religious holidays—arrangements can be made to take the test ahead of time. Missing a test due to an emergency will be handled on a case-by-case basis; such absences must be documented (e.g. a doctor’s note in case of illness) in order to be excused.

Grading: Course grades will be determined as follows:

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| Problem Sets | 100 points |
| Gateway Exam | 50 points |
| Reflection Problems | 150 points |
| Tests (4×100 pts) | 400 points |
| Final Exam | 200 points |
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| TOTAL | 900 points |

Letter grades will be determined based on the total points each student earns: A: at least 810 points; B: 720–809 points; C: 630–719 points; D: 540–629 points; F: fewer than 540 points. Plus and minus grades may be assigned for sums of points near cut-off values.

Problem Sets: Most weeks, a small collection of problems will be assigned for a grade. These will generally be completed outside of class, but occasionally students will be asked to complete them in class (much like a quiz). These assignments serve as an incentive for students to keep current with the course material, as well as a means to provide formative feedback on solution technique and style in preparation for each test. At least two of the lowest problem sets will be dropped for each student; the average of the remaining scores will be used to determine each student's overall problem set grade.

Gateway Exam: In order to pass this course, the student must pass an examination on applying derivative rules. All 50 points will be given for a perfect paper while having only one mistake will earn 35 points; papers with more than one mistake will receive no grade. Students will have three opportunities to pass the gateway exam and must take each scheduled exam until one is passed. Students may re-test for a better score with no penalty.

Reflection Problems: Many mathematics courses heavily emphasize computation; being able to apply correct calculative procedures is important, but it is not "the point" of mathematics. Being able to develop a systematic approach to solving novel complex problems and then clearly and completely explaining their solutions are also important components of developing one's mathematical ability. Throughout the semester, three challenging problems will be assigned. These problems will vary in style and content, but will require using the skills and knowledge acquired from studying calculus—perhaps in a way different from problems seen in class or the homework. Each problem will have three components: an initial individual attempt at solving the problem, a final solution developed and revised within a team, and a brief written reflection on your thought process while working on the problem. More specific guidelines will be provided on Canvas.

Tests: Four tests will be given throughout the semester on the Tuesday and Thursday mornings indicated on the course calendar at the end of this syllabus. Students are expected to take tests at the scheduled times. Conflicts, problems and emergencies will be handled on an individual basis; arrangements for legitimate conflicts must be made far in advance to take a test prior to the scheduled testing time.

Final Exam: The final exam is comprehensive and will be given according to the exam schedule. Students must obtain permission from the Associate Dean of Academic Affairs to take an exam earlier or later than scheduled. Permission may be granted for medical reasons or for participation in educational programs. Any Student who has three exams on the same calendar day (not within a general twenty-four hour period) must document their situation with the Associate Dean for Academic Affairs no later than 5:00 p.m. on Reading Day. Students in this situation will be granted permission to work with one of their instructors to arrange to take one exam at an alternate date (within exam week). You may NOT receive permission to alter your exam schedule for the following reasons: Taking an earlier flight/ride, vacation schedule, weddings (other than your own), graduation or job schedule.

Religious Holidays: Instructors are encouraged, not required, to accommodate students' academic needs related to religious holidays. Please make every effort to negotiate your religious holiday needs within the first two weeks of the semester; waiting longer may compromise your instructor's ability to extend satisfactory arrangements. If you need guidance negotiating your needs related to a religious holiday, the College Chaplain, Rev. Lyn Pace, ppace@emory.edu, Candler Hall 202, is willing and available to help. *Please be aware that Rev. Pace is not tasked with excusing students from classes or writing excuses for students to take to their professors.* Emory's official list of religious holidays may be found at http://www.religiouslife.emory.edu/faith_traditions/holidays.html.

Accessibility: If you have a documented disability and have anticipated barriers related to the format or requirements of this course, or presume having a disability (e.g. mental health, attention, learning, vision, hearing, physical or systemic), and are in need of accommodations for this semester, we encourage you to contact the Office of Accessibility Services (OAS) to learn more about the registration process and steps for requesting accommodations at oas_oxford@emory.edu. If you are a student that is currently registered with OAS and have not requested or received a copy of your accommodation notification letter, please notify OAS immediately. Students who have accommodations in place are encouraged to coordinate sometime with your professor, during the first week of the semester, to communicate your specific needs for the course as it relates to your approved accommodations. Accommodations are not implemented until the instructor is provided an accommodation letter and discusses the accommodation plan for this course face to face with the OAS student. All discussions with OAS and faculty concerning the nature of your disability remain confidential. For additional information regarding OAS, please visit the website: <http://accessibility.emory.edu>.

Inclusivity: Oxford College of Emory University's ideals of inclusivity compel us to foster an environment where people of diverse backgrounds, identities, abilities, and ideologies are affirmed, respected, and seen as a source of strength—where we strive to learn together, and ultimately thrive communally. When these ideals are not upheld, we encourage discussion to better understand and spur action towards improvement. In my teaching, I always aim to challenge your thinking, but never to challenge your identity. If there is anything I can do to help you feel more comfortable and engaged (pronoun usage, calling on you more often, calling on you less frequently, etc.), please let me know.

Support Services: Students should utilize the following resources:

- **Office Hours:** Changes to office hours will be posted on Canvas. These times vary due to meetings and other obligations, but most afternoons should have some availability.
- **Canvas:** Announcements and important documents will be posted on the course's Canvas site. The student is responsible for regularly checking the site for new announcements and resources, including homework assignments and handouts.
- **Supplemental Instruction:** Supplemental instructors are sophomores who have previously taken the course and know how to be a successful student in it. Each SI will offer a weekly session to review course content and provide advice on how to prepare for the course. Attendance is optional, but students often find these sessions very helpful.
- **Math Center:** Student tutors are generally available in the Math Center in Pierce Hall Monday through Thursday afternoons. Additional online resources from the Math Center are available at <http://www.oxfordmathcenter.com>.
- **Study Groups:** When used appropriately, study groups can be a useful tool in learning mathematics. Study groups should complement and enrich individual study of course material; with particular regard to homework assignments, it is suggested that study groups discuss completed (or attempted) assignments rather than work through homework problems for the first time.

THE HONOR CODE OF OXFORD COLLEGE APPLIES TO ALL WORK SUBMITTED FOR CREDIT IN THIS COURSE. BY SUBMITTING SUCH WORK, YOU PLEDGE THAT WORK WAS DONE IN ACCORDANCE WITH THE RULES STIPULATED ON THE ASSIGNMENT AND IN THIS SYLLABUS.

TOPICS BY DAY
Math 111, Fall 2018

| MONDAY | TUESDAY | WEDNESDAY | THURSDAY | FRIDAY |
|---|----------|---|--|--|
| Aug 27th | Aug 28th | Aug 29th 1 Introduction to calculus | Aug 30th | Aug 31st 2 Mathematical induction |
| Sep 3rd NO CLASS (Labor Day Holiday) | Sep 4th | Sep 5th 3 Tangent line, velocity, and other rates | Sep 6th | Sep 7th 4 Limits |
| Sep 10th 5 Squeeze theorem | Sep 11th | Sep 12th 6 Limits and compositions | Sep 13th | Sep 14th 7 Comparison of functions |
| Sep 17th 8 Continuity | Sep 18th | Sep 19th 9 Intermediate value theorem | Sep 20th | Sep 21st 10 The derivative |
| Sep 24th 11 More on the derivative | Sep 25th | Sep 26th 12 Test 1 wrap-up | Sep 27th Test 1 (7:45AM) | Sep 28th 13 Basic derivative rules |
| Oct 1st 14 Trigonometric derivatives | Oct 2nd | Oct 3rd 15 Chain rule | Oct 4th | Oct 5th 16 Implicit differentiation |
| Oct 8th NO CLASS (Fall Break) | Oct 9th | Oct 10th 17 Additional derivative rules | Oct 11th Gateway 1 (8:30AM) | Oct 12th 18 Rate problems |
| Oct 15th 19 Approximation | Oct 16th | Oct 17th 20 Test 2 wrap-up | Oct 18th Test 2 (7:45AM) | Oct 19th 21 Extrema |

| MONDAY | TUESDAY | WEDNESDAY | THURSDAY | FRIDAY |
|---|------------------------------------|--|--|--|
| Oct 22nd 22 Mean value theorem | Oct 23rd | Oct 24th 23 Monotonicity and concavity | Oct 25th | Oct 26th 24 Graphing I |
| Oct 29th 25 Graphing II | Oct 30th | Oct 31st 26 Optimization problems | Nov 1st Gateway 2 (8:30AM) | Nov 2nd 27 Antiderivatives and substitution |
| Nov 5th 28 Differential equations | Nov 6th | Nov 7th 29 Summation and area | Nov 8th | Nov 9th 30 Integration |
| Nov 12th 31 Test 3 wrap-up | Nov 13th Test 3 (7:45AM) | Nov 14th 32 Average value | Nov 15th | Nov 16th 33 Fundamental theorems of calculus |
| Nov 19th 34 Substitution | Nov 20th | Nov 21st NO CLASS (Thanksgiving Recess) | Nov 22nd | Nov 23rd NO CLASS (Thanksgiving Recess) |
| Nov 26th 35 Net change | Nov 27th | Nov 28th 36 Area | Nov 29th Gateway 3 (8:30AM) | Nov 30th 37 Volume I |
| Dec 3rd 38 Volume II | Dec 4th | Dec 5th 39 Test 4 wrap-up | Dec 6th Test 4 (7:45AM) | Dec 7th 40 Course wrap-up |
| Dec 10th 41 Final review | Dec 11th | Dec 12th | Dec 13th Final Exams 08: 12/13 at 9AM 09: 12/13 at 2PM | Dec 14th Final Exams 11: 12/18 at 2PM 02: 12/14 at 9AM 03: 12/17 at 2PM |