

Math 111 Calculus I
Oxford College of Emory University
Spring 2018

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Course Content: Mathematics 111 is the first semester of single-variable calculus. The main topics are limits, differentiation, and integration of functions and applications of these topics; they include the analysis of algebraic and elementary transcendental functions. A calendar of topics is attached to this syllabus.

Course Goals: By the completion of this course, the student should be able to:

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 basic theorems, those that require only 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 rates 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.

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

Class Attendance: The student is expected to attend all classes. An inordinate amount of absences will be handled in accordance with school policies. In addition to the regular class meetings, there will be several tests scheduled on Tuesday or Thursday mornings.

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.

Students may ask questions during office hours and at the Math Center. The instructor may ask to see a

student's homework.

The amount of time required to complete a homework assignment can vary from student to student, but completing each assignment is the most important aspect of preparation for this course; it is worth investing the time necessary to do it!

Quizzes: A brief quiz will be given at the start of most classes. These quizzes are intended as an incentive to keep up with the course material: students who have completed recent homework assignments will be well-prepared for the problems appearing on each quiz. A student's three lowest quizzes will be dropped; additional quizzes may be dropped depending on the total number of quizzes given throughout the semester. The average of the remaining quiz scores will be used to determine each student's overall quiz grade. There is no provision for making up quizzes since many will be dropped.

Gateway Exam: In order to pass this course, the student must pass an examination on applying derivative rules. All 100 points will be given for a perfect paper while having only one mistake will earn 80 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.

Problem Reflections: Throughout the semester, four challenging problems and activities will be assigned. These problems will vary in style and content, but will require using the skills and knowledge acquired from studying calculus in some different way. Responses will consist of a final product (which varies for each assignment) and a one to two page reflection summarizing the thought process, steps taken, and difficulties encountered while completing the assignment. Successfully completing the assigned task is the ultimate goal of each activity; however, a well-documented and thoughtful attempt that comes up short can still earn full credit. A student's grade will be determined by the number of accepted responses: three responses will earn 100 points, with a 20-point penalty for each missing response down to 60 points for submitting one successful response.

Pre-calculus skill test: A diagnostic test on pre-calculus skills will be given in class on Friday, January 19th. It will cover basic algebraic skills (factoring, simplifying expressions, solving equations); transformations of functions (shifts, stretching and reflecting); functions: linear, quadratic, polynomial, rational, square root, algebraic, absolute value, transcendental (trigonometric, inverse trigonometric, exponential, logarithmic), piecewise-defined functions; and graphs of functions.

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. For legitimate excuses including documented special accommodations, arrangements may be made far in advance to take a test prior to the scheduled testing time.

All tests will be comprehensive.

Final Exam: The final exam will be given according to the exam schedule and will be comprehensive. Rescheduling a final exam is rarely accommodated and must be approved by the associate dean of academic affairs.

Grading: Evaluation will be based on the following written work:

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|-------------------------|-------------|
| Quizzes | 150 points |
| Problem Reflections | 100 points |
| Gateway Exams | 100 points |
| Pre-calculus Skill Test | 50 points |
| Tests (4 @ 100 pts) | 400 points |
| Final | 200 points |
| Total | 1000 points |

In general, letter grades will be determined as follows:

A: 91% and above; B: 81 – 90%; C: 71 – 80%; D: 61 – 70%; F: less than 60%

Grades of $A-$, $B+$, $B-$, $C+$, $C-$, $D+$ may be assigned for percentages near the above cut-offs.

Calculators will NOT be allowed on quizzes or tests.

Inclusivity: Students with a documented disability who anticipate barriers related to the format or requirements of this course, or presume to have a disability (e.g. mental health, attention, learning, vision, hearing, physical or systemic) and are in need of accommodations this semester should contact the Office of Accessibility Services (OAS) as soon as possible to learn more about the registration process and steps for requesting accommodations.

Students who are currently registered with OAS who do not receive an accommodation notification letter within the first week of class must notify OAS immediately by emailing adsroxford@emory.edu. Students who have accommodations in place are encouraged to coordinate a face to face meetings with the instructor to communicate specific needs for the course as it relates to approved accommodations. All discussions with OAS and faculty members concerning the nature of a student's disability remain confidential. For additional information regarding OAS and how to register, please visit the website: equityandinclusion.emory.edu/access.

Support Services: Students should utilize the following resources:

- **Office Hours:** 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 before 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 Monday through Thursday afternoons. Additional online resources 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.

Written Style: Thoughts are expressed by sentences: just so in mathematics. Pay attention to your textbook: it is written in sentences. Your written work must be in complete sentences. Note " $1+1 = 2$ "

is a complete sentence (it has a subject “ $1+1$ ”, verb “ $=$ ” and predicate “ 2 ”). Use mathematical symbols wherever appropriate. Your work also needs to be neat and orderly to be intelligible. See the “Calculus Style Guide” on Blackboard.

Tips for Success: Calculus is hard, but it can be made easier by intelligent and efficient study habits. Gauss said the purpose of calculation is insight. Insight is an understanding into why things work the way they do. This should be the goal of working out problems. Know *why* each step is correct and *why* each step was the right step to take. This is more than knowing *that* each step is correct.

Although the homework exercises are not graded, it is important for the success of the student that they be completed as soon after covering the material as possible. Calculators may be used when appropriate, but the student should keep in mind that they are not permitted on the tests. While collaboration is encouraged, each student should be sure that he or she ultimately can *solve problems unaided by notes, the textbook, a calculator, or other people*.

Practice good style on homework. A clean style helps to clean up messy thinking.

In general the student will need to study **at least 9 good hours per week** exclusive of the time spent on review for tests.

Tests are performances, similar to those by athletes, musicians, and dancers. Prepare for them in similar ways.

The topics we will cover are very useful and fundamental in the sciences, business and engineering, among other fields, and we want you all to succeed. However, success in the course will require your diligence and hard work. Be sure to keep up with the assignments and to attend class. Talk to your instructors as soon as you are having problems - don't wait until the week of a test. In addition to learning quantitative skills, it is important that you develop learning skills and study habits that will help you in calculus, in other courses, and in life beyond Oxford College.

Good luck and we hope this will be an enjoyable experience for all of you!

HONOR CODE: THE HONOR CODE OF OXFORD COLLEGE APPLIES TO ALL WORK SUBMITTED FOR CREDIT IN THIS COURSE. TO RECEIVE CREDIT FOR WORK SUBMITTED YOU MUST PLACE YOUR NAME ON IT. BY PLACING YOUR NAME ON SUCH WORK, YOU PLEDGE THAT THE WORK HAS BEEN DONE IN ACCORDANCE WITH THE GIVEN INSTRUCTIONS AND THAT YOU HAVE WITNESSED NO HONOR CODE VIOLATIONS IN THE CONDUCT OF THE ASSIGNMENT.

Tentative Calendar:

| Monday | Tuesday | Wednesday | Thursday | Friday |
|---|--|---|----------|--|
| <div>Jan 15th</div> <div><i>No class MLK holiday</i></div> | Jan 16th | <div>Jan 17th <u>1</u></div> <div>§ Introduction to Calculus</div> | Jan 18th | <div>Jan 19th <u>2</u></div> <div>Precalculus Skill Test</div> |
| <div>Jan 22nd <u>3</u></div> <div>Induction and Problem Solving</div> | Jan 23rd | <div>Jan 24th <u>4</u></div> <div>Last day for changing courses. Mathematical Induction</div> | Jan 25th | <div>Jan 26th <u>5</u></div> <div>§2.2 Introduction to Limits</div> |
| <div>Jan 29th <u>6</u></div> <div>§2.3 Calculating limits</div> | Jan 30th | <div>Jan 31st <u>7</u></div> <div>Calculating limits</div> | Feb 1st | <div>Feb 2nd <u>8</u></div> <div>§2.6 Limits at infinity</div> |
| <div>Feb 5th <u>9</u></div> <div>Review Limits</div> | Feb 6th | <div>Feb 7th <u>10</u></div> <div>§2.5 Continuity</div> | Feb 8th | <div>Feb 9th <u>11</u></div> <div>§2.5 Intermediate Value Theorem</div> |
| <div>Feb 12th <u>12</u></div> <div>Test 1 Review</div> | <div>Feb 13th</div> <div>Test 1 (7:45AM)</div> | <div>Feb 14th <u>13</u></div> <div>§2.7, 2.8 Definition of Derivative</div> | Feb 15th | <div>Feb 16th <u>14</u></div> <div>§3.1, 3.2 Differentiation Rules</div> |
| <div>Feb 19th <u>15</u></div> <div>§3.3 Differentiation Rules</div> | Feb 20th | <div>Feb 21st <u>16</u></div> <div>§3.4 Differentiation Rules</div> | Feb 22nd | <div>Feb 23rd <u>17</u></div> <div>§3.5 Implicit Differentiation</div> |
| <div>Feb 26th <u>18</u></div> <div>§3.6 Derivative of logarithmic functions</div> | Feb 27th | <div>Feb 28th <u>19</u></div> <div>Continuity and Differentiability</div> | Mar 1st | <div>Mar 2nd <u>20</u></div> <div>§3.9 Related Rates</div> |
| <div>Mar 5th <u>21</u></div> <div>Test 2 Review</div> | <div>Mar 6th</div> <div>Test 2 (7:45AM)</div> | <div>Mar 7th <u>22</u></div> <div>§3.9 Related Rates</div> | Mar 8th | <div>Mar 9th <u>23</u></div> <div>Last day to drop. §3.10 Differentials and Approximations</div> |

| Monday | Tuesday | Wednesday | Thursday | Friday |
|--|--------------------------------|--|--|--|
| Mar 12th <i>Spring Break</i> | Mar 13th | Mar 14th <i>Spring Break</i> | Mar 15th | Mar 16th <i>Spring Break</i> |
| Mar 19th <u>24</u> <u>§4.1</u> Maximum and minimum values | Mar 20th | Mar 21st <u>25</u> <u>§4.2</u> Mean Value Theorem | Mar 22nd Gateway 1 8:30AM | Mar 23rd <u>26</u> <u>§4.3</u> Monotonicity and Concavity |
| Mar 26th <u>27</u> <u>§4.5</u> Graphing I | Mar 27th | Mar 28th <u>28</u> <u>§4.5</u> Graphing II | Mar 29th Gateway 2 8:30AM | Mar 30th <u>29</u> <u>§4.7</u> Optimization problems |
| Apr 2nd <u>30</u> <u>§4.9, 5.4</u> Antiderivatives and Indefinite Integral | Apr 3rd | Apr 4th <u>31</u> <u>§5.1</u> Summation and Area | Apr 5th | Apr 6th <u>32</u> Last day for freshman drop. <u>§5.2</u> Definite Integral |
| Apr 9th <u>33</u> Test 3 Review | Apr 10th Test 3 (7:45AM) | Apr 11th <u>34</u> <u>§5.3</u> Fundamental Theorem of Calculus | Apr 12th | Apr 13th <u>35</u> <u>§5.5</u> Substitution |
| Apr 16th <u>36</u> <u>§5.5</u> Substitution | Apr 17th | Apr 18th <u>37</u> <u>§6.1</u> Area Between Curves | Apr 19th Gateway 3 8:30AM Last opportunity | Apr 20th <u>38</u> <u>§6.2</u> Volume - Disc/washer method |
| Apr 23rd <u>39</u> <u>§6.3</u> Volume - Shell method | Apr 24th | Apr 25th <u>40</u> Test 4 Review | Apr 26th Test 4 (7:45AM) | Apr 27th <u>41</u> <u>§6.5</u> Average Value of a Function |
| Apr 30th <i>Last day of classes</i> | May 1st | May 2nd <u>42</u> | May 3rd | May 4th <u>43</u> |