Math 250
Spring 2018

Instructor: Dr. Jonathan Hulgan

Email: jonathan.hulgan@emory.edu

Office: Pierce 122

Phone: 4-4507

Office Hours: To be announced on Canvas.

Text Material: *How to Prove It* (2nd edition) by Daniel J. Velleman; additional resources on Canvas.

Course Content: Mathematics 250 is a survey of basic mathematics with a focus on proving. The course will cover elements of the propositional calculus, the predicate calculus, and techniques of proof (including mathematical induction); sets and the set-theoretical development of basic mathematical objects (relations, functions, operations); and brief introductions to the fields of combinatorics, number theory, group theory, and analysis.

Course Goals: The overall goal is to prepare the student for higher mathematics as well as possible in a semester. If you do take higher mathematics courses, I would appreciate feedback about how well this goal was met. At the end of the course, the student should achieve the following process goals:

1. Read and apply a complicated definition.
2. Produce an example of a thing defined.
3. Read and understand proofs.
4. Understand what needs to be proved in a statement.
5. Apply various strategies for proving a statement.
6. Create simple proofs; to write a proof cogently.

And the student should achieve the following content goals:

1. Understand the propositional and predicate calculi.
2. Know the basic definitions in the fields of set theory, number theory, group theory, and analysis.

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 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!

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. There is no provision for making up missed quizzes since many will be dropped.

Grading: Course grades will be determined as follows:

Quizzes	10%
Homework	30%
Presentations	15%
Revisions	10%
Tests	20%
Final Exam	15%

Final grades will be based on the following ranges: 90.0-100% A, 80.0-89.9% B, 70.0-79.9% C, 60.0-69.9% D, 0-59.9% F. Plus and minus grades will be assigned based on final grade distributions within each whole letter grade.

Quizzes: For the first half of the semester, most classes will begin with a short quiz. These quizzes will be brief and cover statements of facts, such as definitions and standard proof forms. These are intended to ensure students are completing daily reading assignments. Approximately one-fifth of each student's lowest quizzes will be dropped. The average of the remaining quiz scores will be used to determine each student's overall quiz grade.

Homework: Problems will be assigned and collected for credit. Students are to work on these problems ALONE and consult NO OUTSIDE RESOURCES in their completion. To receive full credit the work must be correct, well-written, and submitted before the problem is presented in class (see *Presentations*). Students who have a written solution to a problem chosen for presentation may submit it at that time without penalty; solutions to the problem that are submitted after the presentation will receive at most half credit.

Presentations: Classes will consist mostly of students presenting solutions to assigned problems. Students will be called to present a solution to some problem for which its solution has not already been shown. The presenting student will be evaluated based on the strength of their argument: a sound argument with no mistakes will receive full credit, while an argument with flawed or imprecise reasoning will receive less credit. Students who are not presenting can still contribute by offering insightful suggestions or asking fruitful and well-posed questions.

Revisions: Throughout the semester, students will have select coursework submissions returned to them so that they may be revised. Students will typeset their proof using LaTeX, a common tool for mathematical writing. In addition, students are to write a brief reflection on the revision process, summarizing the changes made to their proof as well as a brief explanation as to why they believe these changes make their proof better. Note that students are permitted to use outside resources to help with understanding and using LaTeX; outside resources are still not permitted for anything related directly to the solution itself. Revisions will be evaluated on the quality of the revised proof, as well as the insight demonstrated in the reflection.

Tests: Two tests will be given, one before spring break and one after. These will be scheduled at at time convenient for all members of the course.

Final Exam: A cumulative final exam will be given at 2pm on Tuesday, May 2. Students must obtain the permission of the Senior Associate Dean of academic affairs to take a final exam earlier or later than scheduled. Permission is normally granted for documented family emergencies, documented medical reasons, or for participation in educational programs. Permission will also be granted for students scheduled to take three exams on a single calendar day (not three exams within a general twenty-four-hour period). Students with three exams on one calendar day must document their situation with the Senior Associate Dean 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 of their exams at an alternate date and time within the official exam week. Leaving early for rides or flights, vacations, relatives' or friends' weddings or graduations, jobs, or having two exams on one day, and other situations, are not considered valid reasons to request an earlier or later exam.

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: The Office of Accessibility Services (OAS) works with students who have disabilities to provide reasonable accommodations. In order to receive consideration for reasonable accommodations, please contact the OAS and complete the registration process. Faculty may not legally provide you with accommodations until an accommodation letter has been processed and discussed with them; accommodations do not start until this point and are not retroactive. Students registered with OAS who receive a letter outlining specific academic accommodations are thus strongly encouraged to immediately coordinate a meeting with their professors to discuss a protocol to implement accommodations that will (or may) be needed over the course of the semester. This meeting should occur as early in the term as possible. Contact Megan Bohinc in OAS for more information at (770)784-4690 or `oas_oxford@emory.edu`.

Inclusivity: Oxford College of Emory University's ideals of inclusivity require that we 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. If we at all fail to support these ideals, then we encourage discussion towards improvement, and we hope that this statement affirms your right to seek those discussions via dialogue with faculty, staff, your peers, and the use of the "Speak Up!" system when needed.

Course Outline: Here is a tentative plan of what topics we will encounter this semester:

Week 1: Introduction

Week 2: Logic and Set Theory (Velleman Ch. 1 & 2)

Week 3: Basic Proof Techniques (Velleman Ch. 3)

Week 4: Relations (Velleman Ch. 4)

Week 5: Functions (Velleman Ch. 5)

Week 6: Test 1

Week 7: Mathematical Induction (Velleman Ch. 6)

Week 8: Infinite Sets (Velleman Ch. 7)

Week 9: *Spring Break (No Class)*

Week 10: Axioms and Natural Numbers (GP, RD, & EL)

Week 11: Natural Numbers (GP, RD, & EL)

Week 12: Test 2

Week 13: Fractions (GP, RD, & EL)

Week 14: Cuts (GP, RD, & EL)

Week 15: Real Numbers (GP, RD, & EL)

Week 16: Final Exam Review

A student's submission of any work to be evaluated for course credit constitutes a declaration that he or she has neither given nor received unauthorized information on the work, nor has condoned the giving or receiving of unauthorized information by others.

Each student at Oxford College of Emory University agrees to abide by the honor pledge and takes upon himself or herself the responsibility of upholding the Honor Code. Each student is urged to inquire of the Honor Council about any doubtful case at any time throughout the year.

Read the full Honor Code at `http://oxford.emory.edu/catalog/regulations/honor-code.html`