

Math 3500/3500H Syllabus Fall 2024

1. COURSE INFORMATION

Dr. Jason Cantarella
Office: Boyd 405
jason.cantarella@gmail.com
or jhc7447@uga.edu

11:10-12:25 TR, Boyd 302
12:40-1:30 W, Boyd 208
<http://www.jasoncantarella.com/wordpress/courses/math-35003510/>
Office hours: Wednesday 3:30-7pm

Please feel free to write me emails at any one of jason.cantarella@uga.edu, jason.cantarella@gmail.com or jhc7447@uga.edu. Replies will come from jason.cantarella@gmail.com. It often takes me a couple of days (or longer) to respond to email, and if I'm going to see you in class first, I'll try to follow up with you in person. Email is generally a bad way to try to answer math questions, so I'm much happier to stay for a few minutes after class or talk during office hours than to try to write math notation in gmail.

Book: **Shifrin, Multivariable Mathematics**

2. COURSE SCHEDULE

Topics	Sections
Vectors	1.1
The Dot Product and Subspaces of \mathbb{R}^n	1.2-1.3
Linear Transformations	1.4
Determinants and the Cross Product	1.5
Scalar and Vector Valued Functions	2.1
Topology of \mathbb{R}^n	2.2
Limits and Continuity	2.3
Partial and Directional Derivatives	3.1
Differentiability	3.2
Differentiation Rules	3.3
The Gradient	3.4
Higher partials	3.6
Exam (Chapters 1-3, excluding 3.5)	TBA
Gaussian Elimination and Linear Systems	4.1
Elementary Matrices and Inverse Matrices	4.2
Linear Independence, Basis, Dimension	4.3
The Four Fundamental Subspaces	4.4
Introduction to Manifolds	4.5
Compactness and Maximum Values	5.1
Maximum and Minimum Problems	5.2
Quadratic Forms and the 2nd Derivative Test	5.3
Lagrange Multipliers	5.4
Final Exam (12:00pm-3:00pm), Boyd 302	Chapters 1-5.4 12/10

3. PREREQUISITES

Students are expected to have a very solid foundation in single-variable calculus, equivalent to that offered in the MATH 2250 and MATH 2260 courses in order to enroll in the course. Students should be prepared for a very challenging and fast-paced theoretical course. Computer skills in Mathematica or similar symbolic computation environment (Sage or Maple) will also be helpful.

4. COURSE GOALS

Students will develop a deep understanding of differential multivariable calculus and elementary linear algebra. Students will understand the definitions of continuity and differentiability for functions of many variables and be able to apply them. Students will learn to take partial derivatives and differentials of functions of several variables, and approximate these functions by linear and polynomial functions. Students will also learn to handle max/min problems involving multiple variables, including the case where additional constraints are imposed. Students will be able to apply the 2nd derivative test in the multivariable case, both theoretically and with computer assistance. Students will be prepared to set up and solve linear algebra problems of the form $Ax = b$ both in an exact and in a least-squares sense. Students will understand matrix rank, kernel, and image and be able to use the rank-nullity theorem.

5. DISCLAIMER

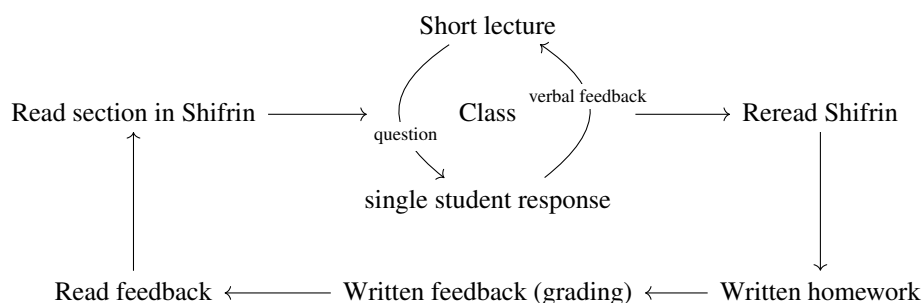
The syllabus is a general course plan, but deviations may become necessary over the course of the semester.

6. PRINCIPAL COURSE ASSIGNMENTS

The course will have a midterm and a final exam. Homework will be assigned using Gradescope, with course entry code given in class.

7. GRADING AND POLICIES, PEDAGOGY

The course plan is that we follow this flowchart (the “core gameplay loop” of math class):



Class will mostly consist of an interactive lecture which assumes that you’ve already read the corresponding section in the book. Everyone will be called on in class (in sequence). Our classroom norm is that *the student who is called on is the only one who speaks (no interruptions)* unless they specifically invite participation from the rest of the class.

The overall course grade is computed from homework, exam, and final exam grades¹ by the formula:

- (1) 30% for the midterm.
- (2) 35% for the final exam.
- (3) 35% for the homework assignments

After grades are calculated for each student using these weights, I will rank the students by average and determine thresholds² for grades of A, B, C, D, and F. Generally, these are somewhat lower than 90%, 80%, 70%, and 60% of the total points in the course. There is no threshold for the number of different grades assigned (all A’s would be fine with me). Students with a higher numerical average almost always receive higher letter grades than those with lower numerical averages.

8. ATTENDANCE POLICY

Students are expected to attend class regularly. Students who miss more than 3 classes (one full week of class) with no excuse may be withdrawn from the course by the instructor.

¹Our discussions in class (and in office hours) are not given a numerical score. However, they do play a part in how I read and grade your work. When writing proofs, it’s often difficult to know how much to write: is a given step “obvious” or “clear”? Or does it require more argument or information? In cases where something seems to be missing on the page, I’ll think back to our conversations: if I already know that you understand the issue very well, then I may be satisfied with a less complete writeup.

²This is a little less fuzzy than it might sound: I do have internal standards for the kind of work that I expect for each grade, but as these are standards for how the students are doing at the *end* of the course, I don’t like to share them at the start.

9. ACADEMIC HONESTY

As a University of Georgia student, you have agreed to abide by the University's academic honesty policy, "A Culture of Honesty," and the Student Honor Code. All academic work must meet the standards described in A Culture of Honesty found at: www.uga.edu/honesty.

It is perfectly acceptable to work on homework problems in groups in this course. However, the help you should get from your fellow students should enable you to complete the problem on your own. Please write up your solutions in your own words.

10. USE OF AI IN THIS COURSE

Go for it! **I will award extra credit** for correct, reproducible AI-generated solutions to the homework problems, as long as you can explain how you know the solution is correct. Please see me if you have discovered such a prompt.

11. UGA STUDENT HONOR CODE

"I will be academically honest in all of my academic work and will not tolerate academic dishonesty of others." A Culture of Honesty, the University's policy and procedures for handling cases of suspected dishonesty, can be found at www.uga.edu/ovpi.

12. MAKE-UP EXAMINATIONS AND LATE WORK

As there are only two exams in the course (the midterm and final), it is not possible to give makeup exams. You may be marked "excused" from an exam if you have an acceptable excuse for missing the exam (generally, these are medical or legal in nature and are communicated before the exam starts). In this case, your grade on the other exam will count for 60% of the course grade. Students who are excused from both the midterm and the final will receive a course grade of "Incomplete".

Each homework assignment (in Gradescope) has a "due date" and a "late due date". The late due date represents the last possible time that I can accept the work for grading, and is generally one week after the due date for the course. While you should make every effort to turn work in by the "due date", you don't have to provide me with any particular reason for turning work between the "due date" and the "late due date". The "late due date" is generally a very firm boundary: you should turn in whatever you have by that point (even if it is very little work). In cases where your work is delayed past the "late due date", it generally can't be accepted for credit, but I would like to have a conversation with you in person about what's happening.

13. GENERAL DISCLAIMER

The course syllabus is a general plan for the course; deviations announced to the class by the instructor may be necessary.

14. ACCOMMODATIONS FOR DISABILITIES

If you plan to request accommodations for a disability, please register with the Disability Resource Center. They can be reached by visiting Clark Howell Hall, calling 706-542-8719 (voice) or 706-542-8778 (TTY), or by visiting <http://drc.uga.edu>.

15. FERPA NOTICE

The Federal Family Educational Rights and Privacy Act (FERPA) grants students certain information privacy rights. See the registrar's explanation at reg.uga.edu/general-information/ferpa/. FERPA allows disclosure of directory information (name, address, telephone, email, major, activities, degrees, awards, prior schools), unless requested in a written letter to the registrar.

16. MENTAL HEALTH AND WELLNESS RESOURCES

UGA Well-being Resources promote student success by cultivating a culture that supports a more active, healthy, and engaged student community. Anyone needing assistance is encouraged to contact Student Care & Outreach (SCO) in the Division of Student Affairs at 706-542-8479 or visit sco.uga.edu. Student Care & Outreach helps students navigate difficult circumstances by connecting them with the most appropriate resources or services. They also administer the Embark@UGA program which supports students experiencing, or who have experienced, homelessness, foster care, or housing insecurity.

UGA provides both clinical and non-clinical options to support student well-being and mental health, any time, any place. Whether on campus, or studying from home or abroad, UGA well-being Resources are here to help.

- Well-being Resources: well-being.uga.edu
- Student Care and Outreach: sco.uga.edu
- University Health Center: healthcenter.uga.edu
- Counseling and Psychiatric Services: caps.uga.edu or CAPS 24/7 crisis support at 706- 542-2273
- Health Promotion/ Fontaine Center: healthpromotion.uga.edu
- Disability Resource Center and Testing Services: drc.uga.edu Additional information, including free digital well-being resources, can be accessed through the UGA app or by visiting <https://well-being.uga.edu>.