

## Math 3500/3500H Syllabus Fall 2023

### 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 323

<http://www.jasoncantarella.com/wordpress/courses/math-35003510/>

Book: **Shifrin, Multivariable Mathematics**

### 2. COURSE SCHEDULE

Topics	Sections	Course Meetings (planned)
Vectors	1.1	8/16
The Dot Product and Subspaces of $\mathbb{R}^n$	1.2-1.3	8/17, 8/22
Linear Transformations	1.4	8/23, 8/24, 8/29, 8/30, 8/31
Determinants and the Cross Product	1.5	8/31, 9/5, 9/6
Scalar and Vector Valued Functions	2.1	9/6
Topology of $\mathbb{R}^n$	2.2	9/12, 9/13
Limits and Continuity	2.3	9/13, 9/14, 9/19 (part)
Partial and Directional Derivatives	3.1	9/19
Differentiability	3.2	9/20, 9/21
Differentiation Rules	3.3	9/26
The Gradient	3.4	9/27, 10/3
Higher partials	3.6	10/4, 10/5
Gaussian Elimination and Linear Systems	4.1	10/5, 10/10
Elementary Matrices and Inverse Matrices	4.2	10/11
Linear Independence, Basis, Dimension	4.3	10/12, 10/18
Exam (Chapters 1-3, excluding 3.5)	5-7 pm	10/18
The Four Fundamental Subspaces	4.4	10/19
Introduction to Manifolds	4.5	10/24
Compactness and Maximum Values	5.1	10/25
Maximum and Minimum Problems	5.2	10/26, 10/31, 11/1
Quadratic Forms and the 2nd Derivative Test	5.3	11/2, 11/7
Lagrange Multipliers	5.4	11/8, 11/9
Projections, least squares	5.5	11/14, 11/15
The Contraction Mapping Principle	6.1	11/16
Inverse and Implicit Functions	6.2	11/28, 11/29
Manifolds Revisited	6.3	11/30, 12/5
<b>Final Exam (12:00pm-3:00pm), Boyd 302</b>	Chapters 1-6	12/7 (Tuesday)

### 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 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

This course mixes reading, lecture, and active learning instructional styles. Each class will be preceded by a reading assignment (with a quiz at the start of class designed to assess what you've learned from the reading). Class will mostly consist of an interactive lecture, with some group and individual in-class exercises. Out-of-class homework will complete the process, giving you harder problems to think and write about.

The overall course grade is computed from homework, exam, and final grades 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, the instructor will rank the students by average and determine thresholds 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. Though improvement and other circumstances are taken into account in deciding thresholds for letter grades, 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 unless they have a medical or pandemic-related reason to miss class. Students who miss more than 3 classes (one full week of class) with no excuse may be withdrawn from the course by the instructor.

## 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](http://www.uga.edu/honesty). Lack of knowledge of the academic honesty policy is not a reasonable explanation for a violation. Questions related to course assignments and the academic honesty policy should be directed to the instructor.

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. Recruiting another student to complete the homework for you, or to simply provide answers to the problems, is a violation of the honesty policy. Please, no ChatGPT or similar AI-generated responses.

Note that uploading the (copyrighted) course materials (such as homework assignments, notes, and tests) to sites such as Studypool, CourseHero, or Chegg is both illegal and a violation of the academic honesty policy. Uploading your own homework answers is not illegal, but it's still a violation of the academic honesty policy.

## 10. 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](http://www.uga.edu/ovpi).

#### 11. MAKE-UP EXAMINATIONS

**No makeup examinations will be given in the course.** 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). 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”.

#### 12. GENERAL DISCLAIMER

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

#### 13. 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>.

#### 14. 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/](http://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.

#### 15. MENTAL HEALTH AND WELLNESS RESOURCES

- If you or someone you know needs assistance, you are encouraged to contact Student Care and Outreach in the Division of Student Affairs at 706-542-7774 or visit <https://sco.uga.edu/>. They will help you navigate any difficult circumstances you may be facing by connecting you with the appropriate resources or services.
- UGA has several resources for a student seeking mental health services (<https://caps.uga.edu/well-being-prevention-programs-mental-health/>) or crisis support (<https://healthcenter.uga.edu/emergencies/>).
- If you need help managing stress anxiety, relationships, etc., please visit BeWellUGA (<https://caps.uga.edu/well-being-prevention-programs-mental-health/>) for a list of FREE workshops, classes, mentoring, and health coaching led by licensed clinicians and health educators in the University Health Center.
- Additional resources can be accessed through the UGA App.

#### 16. TENTATIVE PANDEMIC BACK-UP PLAN(S)

If the University must pivot away from in-class instruction mid-semester and the instructor is neither ill nor caring for ill family members, we will try to film and upload lectures with as many students present as are allowed in the room. Exams will still be given in person if possible, though we may have to schedule multiple seatings in order to meet room capacity requirements.