

MATH 4000/6000: Modern Algebra I - Spring 26

MATH 4000/6000: Modern Algebra I

CRN 25151. MWF 9:55 - 10:50 AM, Boyd Graduate Studies Building, Room 323

Spring 2026

Assignments and other course material

- 1/12 Review of syllabus. Fundamental properties of \mathbb{Z} .

PREREQUISITES

(MATH 3000 or MATH 3300 or MATH 3300E or MATH 3500 or MATH 3500H) and (MATH 3200 or MATH 3200W or CSCI 2610 or CSCI 2610E)

Course synopsis

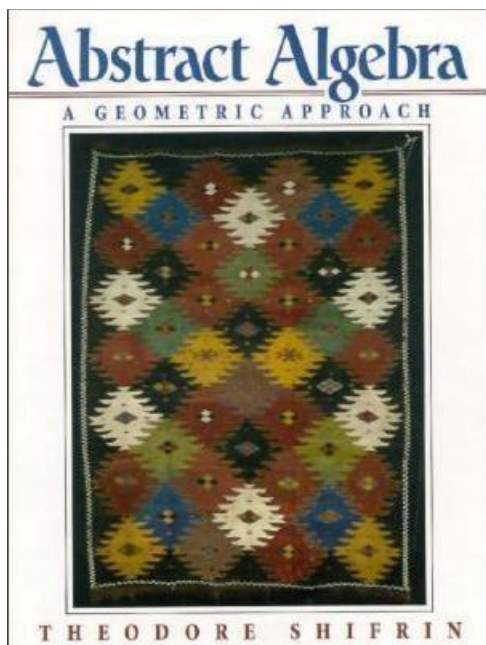
At this point in your mathematical career, you have accumulated a wealth of experience computing with integers, real numbers, and complex numbers. These items are so familiar to you that they may even have the appearance of being God-given --- as if understanding those objects is What Mathematics is All About.

Abstract algebra challenges this notion. Integers, real numbers, and complex numbers are indeed fantastic, but they are fantastic not because they are handed down from on high, but because they have a rich and theory with useful consequences. And given how useful these objects are, we are compelled to isolate (and consider in the abstract) their most important properties. Once we do so, we find that there are many other objects with the same sorts of interesting properties. For example, we will see that the integers are an example of what is called a *ring*, that the real numbers and complex numbers are *fields*, and that the nonzero real numbers form a *group*. These more abstract-seeming objects are not just interesting in an intellectual let's-talk-about-this-over-coffee kind of way, but understanding them deeply often leads to a new understanding of the objects of original interest.

Let me try to bring this back down to earth: Some primes, like 5, can be written as a sum of two squares: $5=1^2+2^2$. And other primes, like 3, cannot. The question of when this is possible is a question about the integers. But the easiest way to answer this question is to visit a totally different mathematically system, the *ring of Gaussian integers*. MATH 6000 students can expect problems about this!

(The official UGA course description, including learning outcomes, can be found [here](#).)

Textbook (required) and Topical Outline



We will aim to cover Chapter 1 (4 weeks), some of Chapter 2 (1 week), Chapter 3 (approx 3 weeks), Chapter 4 (3-4 weeks) and parts of Chapter 6 (whatever remains!).

Topics: Arithmetic in \mathbb{Z} , congruence in \mathbb{Z} and modular arithmetic, abstract rings, congruence in $F[x]$ and arithmetic with residue classes there, ideals and quotient rings, and groups, normal subgroups and quotient groups.

For further adventures in Algebra-land, I encourage you to take MATH 4010/6010.

Homework/ Exams/ Grading

There will be three 55-minute **in-class** exams, as well as a final exam.

- Midterm #1: Friday, February 20
- Midterm #2: Friday, April 3
- Final exam: Wednesday, April 30 8:00 AM - 11:00 AM (location TBA)

No make-up exams will be given. The final exam is **cumulative**. Your grade is made up of the following weighted components:

- Each midterm: 22.5% (total of 45%)
- Homework: 20%
- Final exam: 35%

This class falls into the interactive lecture genre (not entirely unrelated to the practice of call and response in a liturgical context). What this means is that I intend to punctuate the lectures frequently with questions for you. For the show to go on, class participation is absolutely essential. Since you cannot participate in class if you are not present in class, your **attendance is required**. In particular, four or more unexcused absences may result in you being automagically withdrawn from the class. Of course, missing class is sometimes a necessity; keep me posted whenever you have a conflict and we should not have any issues.

Homework will be collected on average once every couple of weeks. To give some idea, the Spring 2025 semester began on 1/6, and there were six assignments in total that term, with due dates of 1/27, 2/5, 2/14, 3/19, 3/31, 4/25. (I don't expect us to follow the same schedule strictly, but probably what we do will not be a million miles away either.) **As a general rule, late homework is not accepted.** Your lowest HW score will be dropped at the end of the semester.

All exams are closed book and closed notes.

Students enrolled in MATH 6000 will take the same exams as the students in MATH 4000 but will be assigned additional homework problems.

You are not only allowed, but **encouraged** to collaborate with your classmates on the homework assignments. The joy of mathematical discovery was meant to be shared! Having said that, collaboration does not mean copying, and consulting AI tools such as ChatGPT is not "collaboration" in the sense intended. You may not copy solutions from a textbook, classmate, website (including an AI tool), etcetera, and you must be the one to handwrite (or type) your solutions.

By entering UGA, you have already agreed to abide by the UGA 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 honesty.uga.edu.

A good rule of thumb is that you should be able to explain any work you turn in to a hypothetical interrogator.

Statement on Generative AI use

If you plan to request accommodations for a disability, please register with Accessibility and Testing. Accessibility and Testing can be reached by visiting Clark Howell Hall, by calling [706-542-8719](tel:7065428719) (voice) or [706-542-8778](tel:7065428778) (TTY), or by visiting accessibility.uga.edu.

Special accommodations

Students with disabilities who may require special accommodations should talk to me as soon as possible. Appropriate documentation concerning disabilities may be required. For further information, please visit the [Accessibility and Testing page](#).

UGA Well-being 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](tel: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](tel:706-542-2273)
- Health Promotion/ Fontaine Center: healthpromotion.uga.edu
- Accessibility & Testing: accessibility.uga.edu

Additional information, including free digital well-being resources, can be accessed through the UGA app or by visiting well-being.uga.edu.

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.

Disclaimer

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