

Math 361: Abstract Algebra

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Student Help Hours (Formerly known as Office Hours) MWF 1:10 - 2:10 pm, Th 10:15 am - noon, or by appointment. Come by my office or join me on Zoom, whichever is easier for you.

Course Description This course is an introduction to modern abstract algebra which focuses primarily on groups, rings, and fields. We will see many examples of these both familiar and unfamiliar, and learn how to generalize our ideas of addition, multiplication, and division to new settings. Along the way, students will practice creating, analyzing, and communicating logically reasoned arguments.

Learning Outcomes By the end of this course, successful students will be able to:

- Construct a valid proof that proceeds efficiently from hypotheses to conclusion
- Use basic definitions and properties of groups and rings
- Investigate basic properties in a wide range of algebraic examples
- Effectively communicate mathematical results both in writing and in presentations

Course Materials *Contemporary Abstract Algebra*, Joseph Gallian, 9th Edition

Important Dates We will have three take-home tests, the third of which replaces a final exam. Their due dates are listed below.

Test 1 **Monday 2/12, by 10:50 am**

Test 2 **Monday 3/18, by 10:50 am**

Test 3 **Monday 4/29, by noon**

Course Grades The final course grade is determined in the following way:

Vocabulary/Co-Curricular Activities	10%
Written Homework	35%
Presentations/Participation	22%
Tests (11% each)	33%

A grade scale will be determined after final grades are computed, but will be no worse than the scale given below.

		B+	87-89	C+	77-79	D+	67-69		
A	93-100	B	83-86	C	73-76	D	63-66	F	0-59
A-	90-92	B-	80-82	C-	70-72	D-	60-62		

Course Format

This class will be split between short intro lectures, in class work time, and student presentations. Each section of the course will follow the same week-long cycle. The first day of each cycle will be an intro lecture day, after which practice problems, written homework, and presentation problems will be assigned for the week. The second day will be a workshop day where we'll discuss questions on the material and prepare for presentations. The final day will be student presentations.

Vocabulary

We will have a short weekly vocabulary quiz at the start of each workshop day where you will be asked to complete basic definitions and theorems. These quizzes are to help you stay caught up on new vocabulary and important ideas, since it is impossible to understand what is happening in class or write good proofs if you are not clear on the definitions of the words being used or the theorems being cited. I will post new vocabulary words from each week's material on Inquire. No make up quizzes will be given, but at the end of the semester I will drop your lowest quiz score.

Co-Curricular Activities The MCSP department and Roanoke College offer many opportunities to engage with mathematical ideas outside of classes. Members of this class are encouraged to attend many of these activities, however attending at least three is mandatory. Examples include MCSP Conversation Series talks and student research showcases - if you're unsure if a given activity makes sense for this purpose, please email me to ask. Within one week of attendance you must submit a brief response to the activity. Each response will count as one vocabulary quiz grade.

Written Homework There will be a written homework set due at the end of every weekly cycle (typically the start of class Monday). Submit your homework as a PDF or Word file using the links on our Inquire page or hand it in on paper at the start of class. **If you are unable to complete the homework on time for some reason, please contact me about that as soon as you can so we figure out how to handle the situation.** Otherwise I'll be unable to give you credit for late homework. I encourage you to work with your classmates on the mathematics of these assignments, but you must write up your solution independently. (This means you should not look at anyone else's write-up or let anyone else but me see yours.) You may not work on homework with anyone besides me and your classmates. These assignments are open book and open notes, but you must get permission from me before you use any other outside resources to work on homework problems.

Presentations On the last day of each cycle (typically Friday), students will present solutions to problems from the previous week's chapter(s). I will assign groups and problems as part of the intro to each week's material. These presentations are graded on participation, and my expectations are: that you go to the board having thought seriously about the problem beforehand, be able to talk clearly about the ideas being discussed, and either solve the problem yourself or facilitate a class discussion to solve it. This means even if you are not at the board you can participate by helping your classmates if they get stuck. I expect that each of you will present roughly 6-7 times throughout the semester.

Participation

As we work through the course material, I expect you to come to class prepared and willing to contribute to our progress. There will be many ways to do this, including: working on problems during class time, supporting your peers during their presentations, joining class discussions, and asking good questions.

Attendance Policy

Class attendance is expected because doing well in this class is hard if you aren't here to work on the material with us. However, life happens and sometimes you have to miss. If you know in advance you're going to miss class, make sure you turn in any work due that day (Inquire makes this easy!). Let me know if you need help learning the material we're going to cover, whether that means getting connected with someone who will share their notes or coming to office hours with questions. If you are going to miss a test, let me know as soon as you can so we can figure out how to handle that. If you don't know in advance (because sometimes life happens unexpectedly), talk with me as soon as you can about what you can make up and how to get caught up. I will be as generous as I can while still keeping the class fair for all students.

Mask Policy

Unless the college changes its policy, face coverings/masks are no longer required. However, anyone is welcome to wear a mask for some or all of the semester. **If you feel sick and plan to come to class, please wear a mask over your nose and mouth!** (The rest of the class thanks you in advance.)

Special Needs

If you have a disability that may require an accommodation in this course, please provide me with your documentation within the first 2 weeks of the semester. (Check with the Center for Teaching and Learning for their scheduling guidelines.)

Expected Work Policy This course expects you to spend at least 12 hours of work each week inside and outside of class.

Academic Integrity I expect all of you to follow the Academic Integrity policies of Roanoke College. All graded work should be your own work! If you ever have questions about how these policies apply to our class please contact me. Any violations of these policies will automatically be turned over to the Academic Integrity Council.

Course Schedule The following schedule is approximate and subject to change, but it should give you some idea of the timing of the topics covered and assignments.

Dates	Topic	Notes
1/17 - 1/19	Chapter 0: Preliminaries	
1/22 - 1/26	Chapter 1 / Chapter 2: Groups	
1/29 - 2/2	Chapter 3: Finite Groups	
2/5 - 2/9	Chapter 4: Cyclic Groups	
2/12 - 2/16	Chapter 5: Permutation Groups	Test 1 assigned 2/12
2/19 - 2/23	Chapter 6: Isomorphisms	Test 1 due 2/19
2/26 - 3/1, 10/25	Chapter 7: Cosets, Lagrange's Theorem	
Spring Break		
3/11 - 3/15	Chapter 8: External Direct Products	
3/18 - 3/22	Chapter 9: Normal Subgroups, Factor Groups	Test 2 assigned 3/18
3/25 - 4/1	Chapter 10: Group Homomorphisms	Test 2 due 3/25, No class 3/29
4/3 - 4/10	Chapter 12: Rings / Chapter 13: Integral Domains	No class 4/8
4/12 - 4/19	Chapter 14: Ideals, Factor Rings	
4/22 - 4/23	Chapter 15: Ring Homomorphisms	Test 3 assigned 4/22
Fri 4/26	Chapter 15 Presentations / Office Hours	10 am - 1 pm
Mon 4/26	Test 3 due by noon	