

Syllabus for Math 430, *Abstract Algebra I*, Spring 2024

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Office Hours: M,W 12:30-1:30pm, F 10:30-11:15am, and by appointment

COURSE GOALS: This is a one semester course of introductory abstract algebra covering groups, rings and fields. We will cover Chapter 1-18 and 26-31 of the text. Ch. 1, 2, 3 and 15 are review from Math 245. Prerequisites are Math 300 and Math 245. This is a proof-based course.

REQUIRED TEXT: *A Friendly Introduction to Abstract Algebra*, by Ryota Matsuura.

GRADING: The grading will be assigned the following scale:

A: 90-100%, B: 80-89%, C: 70-79%, D 60-69%, F: Below 60%

There will be no curves and no extra credit. I will assign +/- on an individual basis. Points are assigned as follows:

Quizzes (10) - 100 points
Midterm exams (3) - 100 points each
Homework - approximately 80 points
Final exam - 150 points

QUIZZES: There will be a 10 point quiz each Friday. This quiz will cover material through the previous class. Quiz questions will consist mainly of definitions, theorems, short answers, and short proofs. The 10 best quiz scores will be kept, and the rest will be dropped. There will be no make up quizzes given. The quizzes are a good way for you to gauge your understanding of the current material and to keep up with the homework. You will need to take the quizzes in pencil. Please bring one to class.

L^AT_EX: In this class we will use the mathematical typesetting program L^AT_EX. L^AT_EX is the standard typesetting tool of mathematicians all over the world. Whether you will be teaching, working in business or in academia, L^AT_EX will be useful for preparing mathematical documents. See canvas or my website for information on installing, running and using L^AT_EX.

HOMEWORK: Homework will be assigned after each chapter. We will discuss the homework on Fridays. Most of it will not be collected. About once a week or so I will assign problems to be typed in L^AT_EX and handed in for grading. Late assignments will not be accepted. We will not have time to go over all of the homework in class. Be sure to use office hours and emails if you have additional questions on homework problems.

ATTENDANCE: Attendance at in-person class meetings is required and will be taken each class day. If you are sick, please do not come to class. Contact me by email within 24 hours and your absence will be excused. You will still need to turn in all assignments. Online notes and assignments will be available. If you need an extension due to illness, let me know.

MIDTERMS and FINAL: There will be three midterms during the semester worth 100 points each and a final exam worth 150 points. The questions on the exams will be similar to homework questions and will contain proofs. Exams will be given in the *evenings* to give you enough time to write out your proofs. If you are unavailable at the time of the exam, you can schedule another time with me to take the exam. If you cannot make it to your scheduled exam time, you **MUST** contact me **BEFORE** the exam if at all possible, or if an emergency, **WITHIN 24 HOURS** after the exam if you need to schedule a make up exam. Make up exams will only be given for extreme excuses.

Dates for exams (subject to change): Midterm I - Tuesday, February 6, Midterm II - Wednesday March 6, Midterm III Tuesday April 15, **Final Exam** - Monday May 6, 10:30am-12:30pm

CLASS STRUCTURE: This class will be taught using “inquiry-based learning” (IBL). There will be very little formal lecture. You will work in groups to solve problems, come up with definitions and theorems, and write proofs. We will cover approximately 1 chapter each Monday and 1 chapter each Wednesday. Read the chapter before class and again after class before starting the homework (Chapters are short and concise). Each Friday we will review concepts, go over homework and take a quiz at the end of class. The quiz will cover material since the last quiz or exam.

ADDITIONAL HELP: You are encouraged to work together in this class and form study groups. But any work you turn in must be your own. **TALK** about mathematics with each other. **WRITE** down your thoughts and ideas. **SHARE** these ideas with your group and with the class. Before each class you should read the section that is to be covered. **Write down any definitions, theorems and concepts from class on index cards.** Use these cards to study for the quizzes and exams. You should know the definitions for quizzes and exams. You do not have to know the definition word for word from the text or the notes, but it should be correct and complete. You are welcome to e-mail homework questions to me, but if you are referring to a homework problem, please include the entire question, because I may not have access to a book when I answer your e-mail.

HONOR CODE: You are to abide by the JMU honor code at all times. Ignorance of the law is no excuse. Cheating will not be tolerated and will be prosecuted to the fullest extent. Please familiarize yourself with the honor code here: <http://www.jmu.edu/honor/code.shtml>. When turning in homework or group work, you may work together and discuss the problems, but you must write up the homework to turn in **by yourself**. Every answer requires an explanation, and no two student’s explanations will be exactly the same. Copying someone else’s homework or copying something from the internet - even if you change a few words or symbols - without citation is a violation of the Honor Code. Do not share your \LaTeX code with anyone. You are welcome to look at each other’s code, but do not share files, and do not copy code from someone else word for word.

ADDITIONAL UNIVERSITY POLICIES: For University policies regarding attendance, inclement weather, disability accommodations and religious accommodations, please see: <http://www.jmu.edu/syllabus/>

MENTAL HEALTH SUPPORT: The JMU Counseling Center <https://www.jmu.edu/counselingctr/> has many resources and programs that are free to students seeking help and support. [Madison Cares](#) is a referral service for JMU community members to refer a student to get help. If you find yourself facing severe stress, suffering mental pain, enduring abuse, or having a difficult time coping with everyday life, please feel free to reach out to me. Together we can find resources on campus that can provide you with assistance and support.

FIRST WEEK ATTENDANCE POLICY: At the instructor’s discretion, any student registered for a class in the Department of Mathematics and Statistics who does not attend at least one of the first two scheduled meetings of the class **MAY** be administratively dropped from the class. Students will be

notified by e-mail if they will be dropped. Students who fail to attend should not assume they will be administratively dropped by their instructor; it is the student's responsibility to drop the course on their own or they will receive a grade at the end of the semester. All students are responsible for verifying the accuracy of their schedules and changes made in their schedules.

EQUITY AND INCLUSION: Mathematics is for everyone, and everyone can do mathematics. YOU are welcome in this class, and YOU can do mathematics. I support every student in learning mathematics regardless of age, gender, identity, race, religion, orientation, economic situation, language ability, major, or anything else. Our class and my office are safe places for every student. I affirm that the lives and experiences of Black, Indigenous and People of Color matter and are valued in this class. I invite you to share anything with me that might help create a more inclusive and welcoming learning environment.

LEARNING: Your goal in this class is to learn proofs and discrete math. My role is to facilitate that learning. You will get out of this class what you put in to it. There are no shortcuts. You **MUST** do the homework. You **MUST** study for the quizzes each week. You **MUST** get help as soon as you do not understand a concept so that you can **LEARN** it and move on to the next one. Learning is not easy. It takes effort and persistence. It is a struggle. Do not see your mistakes as failures, but rather as learning opportunities! It is the struggle that leads to learning. **Embrace the challenge!**

Math 430 Spring 2024 tentative outline

- Week 1 **January 14-19** No class Monday, MLK Day. Class overview, \LaTeX , Ch 1 Proofs, Ch 2 Sets
- Week 2 **January 22-26** Ch 3 Divisors, Ch 4 \mathbb{Z}_7 . Quiz 1
- Week 3 **January 29-Feb. 2** Ch. 5 D_4 , Ch. 6 S_n , Quiz 2
- Week 4 **February 5-9** Ch 7 $M(\mathbb{Z}_{\neq 4})$, Ch. 8 Groups, Quiz 3
- Week 5 **February 12-16** Review, **Tuesday evening Exam 1, Ch 1-8**, Ch. 9 Small Groups, Quiz 4
- Week 6 **February 19-23** Ch 10 Matrix Groups, Ch. 11 Subgroups, Quiz 5
- Week 7 **February 26-Mar 1** Ch. 12 Order of an element, Ch. 13 Cyclic Groups I, Quiz 6
- Week 8 **March 4 - March 8** Ch. 14 Cyclic Groups II, Review, **Wednesday evening Exam 2, Ch 9-14, Friday Asynchronous Day**
- Week 9 **March 11-15 SPRING BREAK**
- Week 10 **March 18-22** Ch. 15 Functions, Ch. 16 Isomorphisms, Quiz 7
- Week 11 **March 25-29** Ch. 17 Homomorphisms I, Ch. 18 Homomorphisms II, Quiz 8
- Week 12 **April 1-5** Ch. 26 Rings, Ch. 27 Integral Domains and Fields, Quiz 9
- Week 13 **April 8-12** Ch 28 Polynomials I, Ch. 29 Polynomials II, Quiz 10
- Week 14 **April 15-19** Review **Tuesday evening Midterm 3 Ch. 15-18, 26-29**, Ch. 30 Factoring, Quiz 11
- Week 15 **April 22-26** Ch. 31 Homomorphisms and more factoring, Quiz 12
- Week 16 **April 29-May 1** Review, **Last Day of Class**
- Week 17 **Monday May 6 Final Exam 10:30am-12:30pm**

Math 430 Spring 2024 Homework Problems

- Ch 1 Proofs: 1-7, 9, 12, 13, 15-18, 20
- Ch. 2 Sets: 1-4, 6, 8-12, 14, 17, 20, 21
- Ch 3 Divisors:
- Ch 4 \mathbb{Z}_7 :
- Ch 5 D_4 :
- Ch. 6 S_n :
- Ch 7 $M(\mathbb{Z}_{p^k})$:
- Ch. 8 Groups:
- Ch 9 Small Groups:
- Ch 10 Matrix Groups:
- Ch 11 Subgroups:
- Ch. 12 Order of an element:
- Ch. 13 Cyclic Groups I:
- Ch. 14 Cyclic Groups II:
- Ch. 15 Functions:
- Ch. 16 Isomorphisms:
- Ch. 17 Homomorphisms I:
- Ch. 18 Homomorphisms II:
- Ch. 26 Rings:
- Ch. 27 Integral Domains and Fields:
- Ch 28 Polynomials I:
- Ch. 29 Polynomials II:
- Ch. 30 Factoring:
- Ch. 31 Homomorphisms