

Math 444: Abstract Algebra (4.0 units)**Time & Place: 1:30-2:35 MWF in RLC 104****Instructor:** Dr. Catherine Crockett**email:** catherinecrockett@pointloma.edu**office phone:** 619-849-2723**Office:** Gym parking lot, Trailer #2**Office hours:** M, 8:30-9:30, MWF 10:30- 12, T TH 9:30-11:30, or by appointment (please email for appointment).**Important Dates:** Exam 1: 9/17 (Monday- week 4)

Exam 2: 10/15 (Monday- week 8)

Exam 3: 11/12 (Monday- week 12)

Final Exam (comprehensive): 12/12 1:30- 4:00 (Wednesday)

Text: *A first Course in Abstract Algebra*, 7th edition, by John B. Fraleigh**Prerequisite:** MTH 232, MTH 242 and junior standing.**PLNU Mission**

To Teach ~ To Shape ~ To Send

Point Loma Nazarene University exists to provide higher education in a vital Christian community where minds are engaged and challenged, character is modeled and formed, and service becomes an expression of faith. Being of Wesleyan heritage, we aspire to be a learning community where grace is foundational, truth is pursued, and holiness is a way of life.

Department Mission

The Mathematical, Information, and Computer Sciences department at Point Loma Nazarene University is committed to maintaining a curriculum that provides its students with the tools to be productive, the passion to continue learning, and Christian perspectives to provide a basis for making sound value judgments.

COURSE DESCRIPTION

A study of groups, rings, fields and related structures, with selected applications.

LEARNING OUTCOMES

This is a course on theoretical mathematics. The learning outcomes are:

Students will be able to write proofs.

Students will be able to demonstrate facility with algebraic structures.

Students will be able to speak about their work with precision, clarity and organization.

Students will be able to write about their work with precision, clarity and organization.

Students will collaborate effectively in teams.

Students will be able to understand and create arguments supported by quantitative evidence, and they can clearly communicate those arguments in a variety of formats.

COURSE PHILOSOPHY

Mathematics requires active participation. Participation means: asking questions, making conjectures and checking them, providing solutions to problems, sharing ideas with classmates. During class time I will participate in the same way.

ASSESSMENT AND GRADING

Grades for the course will be based on:

Exams (3 at 15% each)	45% of the course grade
Homework	25% of the course grade
Final exam (comprehensive)	<u>30% of the course grade</u>
Total:	100%

Grading Scale: Approximate minimal percentages required to obtain a given grade are:

Grades in percentages

	A	B	C	D	F
+		[87.5,90)	[77.5, 80)	[67.5, 70)	[0,60)
	[92.5,100]	[82.5,87.5)	[72.5, 77.5)	[62.5,67.5)	
-	[90, 92.5)	[80, 82.5)	[70, 72.5)	[60, 62.5)	

Homework (25%): Homework will be assigned every class meeting. All homework assigned in a week will be due **at the start of class** the next Wednesday. See calendar for exact dates. A homework assignment is late if it is not received at the start of the class on the due date. No late homework will be accepted except by prior arrangement (with me) or with a documented emergency. However, the lowest homework score will be dropped.

The object of the homework is to learn how to do the problems so there should be calculations on your homework using the terminology and methods of the class and not just an answer. In addition, there will be proofs in the homework almost every week.

Please be sure that your homework is stapled together and the problems are in order. Homework will be scored on a combination of completeness (with work shown) and correctness. A random selection (the same for all people) of the problems will be graded on any homework assignment

Exams (15% each): There are three in-class exams. If you do not take an exam you will receive a zero for it. Late exams may be taken only by prior arrangement with me or a well-documented emergency beyond your control. The examination schedule is included in the daily schedule. I do not intend to accept excuses such as poor communication with parents, benefactors, sport team sponsors and/or travel agents.

Final Exam (30%): The final is **comprehensive and is given on Wednesday, December 12 1:30 to 4:00**. The final exam date and time is set by the university at the beginning of the semester and may not be changed by the instructor.

Class Enrollment: It is the student's responsibility to maintain his/her class schedule. Should the need arise to drop this course (personal emergencies, poor performance, etc.), the student has the responsibility to follow through (provided the drop date meets the stated calendar deadline established by the university), not the instructor. Simply ceasing to attend this course or failing to follow through to arrange for a change of registration (drop/add) may easily result in a grade of F on the official transcript.

Side Note: Turn off any cell phone, pager or things that make noise while you are in class. Also, do not text or work on other classes while in class -to do so is disrespectful to your classmates and me. You may be asked to leave the class for such behavior, resulting in an absence.

General Advice:

You learn mathematics by doing it yourself. You should expect to spend approximately two hours outside of class for every one hour in class working on homework and going over concepts. When doing homework, please note it is normal to not be able to do every problem correct on the first attempt. Do not be discouraged, instead seek help.

For information about the class, homework assignments, handouts or grades, please log onto canvas.pointloma.edu. There you will find all of this class information. Please let me know if you can't access the class information or have any questions.

Sources of Help:

1. Me. If you have questions, ask me. See my office hours or email catherinerockett@pointloma.edu
2. Other classmates. Form study groups! Work together!
3. The MLC (in Rohr science room 230)- schedule posted outside the room.

University Policies:

FINAL EXAMINATION POLICY

The final exam date and time is set by the university at the beginning of the semester and may not be changed by the instructor. This schedule can be found on the university website and in the course calendar. No requests for early examinations will be approved. Only in the case that a student is required to take

three exams during the same day of finals week, is an instructor authorized to consider changing the exam date and time for that particular student.

PLNU COPYRIGHT POLICY

Point Loma Nazarene University, as a non-profit educational institution, is entitled by law to use materials protected by the US Copyright Act for classroom education. Any use of those materials outside the class may violate the law.

Credit Hour

In the interest of providing sufficient time to accomplish the stated course learning outcomes, this class meets the PLNU credit hour policy for a 4-unit class delivered over 15 weeks. Specific details about how the class meets the credit hour requirements can be provided upon request.

PLNU ACADEMIC HONESTY POLICY

Students should demonstrate academic honesty by doing original work and by giving appropriate credit to the ideas of others. Academic dishonesty is the act of presenting information, ideas, and/or concepts as one's own when in reality they are the results of another person's creativity and effort. A faculty member who believes a situation involving academic dishonesty has been detected may assign a failing grade for that assignment or examination, or, depending on the seriousness of the offense, for the course. Faculty should follow and students may appeal using the procedure in the university Catalog. See http://catalog.pointloma.edu/content.php?catoid=24&navoid=1581#Academic_Honesty for definitions of kinds of academic dishonesty and for further policy information.

PLNU ACADEMIC ACCOMMODATIONS POLICY

Academic Accommodations:

While all students are expected to meet the minimum standards for completion of this course as established by the instructor, students with disabilities may require academic adjustments, modifications or auxiliary aids/services. At Point Loma Nazarene University (PLNU), these students are requested to register with the Disability Resource Center (DRC), located in the Bond Academic Center. (DRC@pointloma.edu or 619-849-2486). The DRC's policies and procedures for assisting such students in the development of an appropriate academic adjustment plan (AP) allows PLNU to comply with Section 504 of the Rehabilitation Act and the Americans with Disabilities Act. Section 504 (a) prohibits discrimination against students with special needs and guarantees all qualified students equal access to and benefits of PLNU programs and activities. After the student files the required documentation, the DRC, in conjunction with the student, will develop an AP to meet that student's specific learning needs. The DRC will thereafter email the student's AP to all faculty who teach courses in which the student is enrolled each semester. The AP must be implemented in all such courses.

If students do not wish to avail themselves of some or all of the elements of their AP in a particular course, it is the responsibility of those students to notify their professor in that course. PLNU highly recommends that DRC students speak with their professors during the first two weeks of each semester about the

applicability of their AP in that particular course and/or if they do not desire to take advantage of some or all of the elements of their AP in that course.

PLNU ATTENDANCE AND PARTICIPATION POLICY

Attendance is expected at each class session. In the event of an absence you are responsible for the material covered in class and the assignments given that day.

Regular and punctual attendance at all classes is considered essential to optimum academic achievement. If the student is absent from more than 10 percent of class meetings, the faculty member can file a written report which may result in de-enrollment. If the absences exceed 20 percent, the student may be de-enrolled without notice until the university drop date or, after that date, receive the appropriate grade for their work and participation. See

[http://catalog.pointloma.edu/content.php?catoid=24&navoid=1581#Class Attendance](http://catalog.pointloma.edu/content.php?catoid=24&navoid=1581#Class_Attendance) in the Undergraduate Academic Catalog.

Course Schedule:

Please note this schedule is tentative. Any changes will be announced.

week	Monday	Wednesday	Friday
1 8/27- 8/31	8/27- no class Class on 8/28(Tuesday) Sec 0: Sets and Relations Sec 1: Introduction and Examples	8/29 Sec 1: Introduction and Examples Sec 2: Binary Operations	8/31 Sec 2: Binary Operations Sec 3: Isomorphic Binary Structures
2 9/03- 9/07	9/03 No Class Labor Day	9/05 Sec 4: Groups HW #1 Due	9/07 Sec 5: Subgroups
3 9/10- 9/14	9/10 Sec 6: Cyclic groups Sec 7: Generating Sets and Cayley Digraphs	9/12 Sec 7: Generating Sets and Cayley Digraphs HW #2 Due	9/14 Review for Exam #1
4 9/17- 9/21	9/17 Exam #1 (sections 0-7) HW #3 Due	9/19 Sec 8: Groups of Permutations	9/21 Sec 9: Orbits, Cycles, and the Alternating Groups
5 9/24- 9/28	9/24 Sec 9: Orbits, Cycles, and the Alternating Groups Sec 10: Cosets and the Theorem of Lagrange	9/26 Sec 10: Cosets and the Theorem of Lagrange Sec 11: Direct Products and Finitely Generated Abelian Groups HW #4 Due	9/28 Sec 11: Direct Products and Finitely Generated Abelian Groups
6 10/01- 10/05	10/01 Sec 13: Homomorphisms	10/03 No class Special Assignment on Sec 13: Homomorphisms	10/05 No Class Special Assignment on Sec 14: Factor Groups

		Sec 14: Factor Groups Hw #5 Due	Sec 15: Factor-Group Computations and Simple Groups
7 10/08-10/12	10/08 Sec 14: Factor Groups	10/10 Sec 15: Factor-Group Computations and Simple Groups HW #6 Due	10/12 Review For Exam #2
8 10/15-10/19	10/15 Exam #2 (Sections 8-15) HW #7 Due	10/17 Sec 18: Rings and Fields	10/19 No classes Fall Break Day
9 10/22-10/26	10/22 Sec 18: Rings and Fields Sec 19: Integral Domains	10/24 Sec 19: Integral Domains Sec 20: Fermat's and Euler's Theorems	10/26 Sec 20: Fermat's and Euler's Theorems
10 10/29-11/02	10/29 Sec 21: The Field of Quotients of an Integral Domain	10/31 Sec 21: The Field of Quotients of an Integral Domain Sec 22: Rings of Polynomials HW #8 Due	11/02 Sec 22: Rings of Polynomials
11 11/05-11/09	11/05 Sec 23: Factorization of Polynomials over a Field	11/07 Sec 23: Factorization of Polynomials over a Field HW #9 Due	11/09 Review for Exam #3
12 11/12-11/16	11/12 Exam #3 (Sections 18-23) HW #10 Due	11/14 Sec 26: Homomorphisms and Factor Rings	11/16 Sec 27: Prime and Maximal Ideals
13 11/19-11/23	11/19 Sec 27: Prime and Maximal Ideals	11/21 No Class Thanksgiving Break	11/23 No Class Thanksgiving Break
14 11/26-11/30	11/26 Sec 29: Introduction to Extension Fields	11/28 Sec 29: Introduction to Extension Fields Sec 30: Vector Spaces HW #11 Due	11/30 Sec 30: Vector Spaces Sec 31: Algebraic Extensions
15 12/03-12/07	12/03 Sec 31: Algebraic Extensions Sec 33: Finite Fields	12/05 Sec 33: Finite Fields HW #12 Due	12/07 Review
Finals week 12/10-12/14	12/10	12/12 Comprehensive final exam 1:30-4:00	12/14