Math 401 Introduction to Abstract Algebra Winter 2015

Instructor Amites Sarkar

Text Contemporary Abstract Algebra (7^{th} ed.)
Joseph A. Gallian

Syllabus

Chapters 1 through 11 of the book.

Overview

This course is an introduction to **group theory**. The concept of a group is one of the great unifying ideas in mathematics. It arises in number theory, in the theory of polynomial equations, and in geometry. Group theory is really just the study of **symmetry**. Physicists use group theory to study the symmetries of physical laws (e.g. Maxwell's equations), and chemists use group theory to study the symmetries of crystals and molecules. Groups can be finite or infinite, and we shall see examples of both types.

The level of abstraction for this course is higher than for any course you have already taken. The "abstract vector spaces" part of our Linear Algebra course (Math 204) is probably closest in spirit. But I will include plenty of examples, so don't worry.

Exams

Midterm 1 Friday 30 January
Midterm 2 Friday 27 February
Final Wednesday 18 March 8–10 am

Grading

The midterms are each worth 25%, and the final is worth 50%. If you feel too ill to take an exam, don't take it, but bring a doctor's certificate to me when you feel better and I will make arrangements.

Office hours

My office hours are 11–11:50 on Mondays, Tuesdays, Thursdays and Fridays, in 216 Bond Hall. My phone number is 650 7569 and my e-mail is amites.sarkar@wwu.edu

Course objectives

The successful student will demonstrate:

1. Knowledge of the group axioms, and familiarity with various examples of groups, including those from geometry, algebra, and number theory.

2. Understanding of the statement and proof of Lagrange's theorem for finite groups.

3. Understanding of the definition of isomorphism of groups, and the properties it preserves.

4. Understanding of the definition of homomorphism of groups, and the properties it preserves.

5. Understanding of the definition of a normal subgroup and its relationship with factor groups and homomorphisms.

6. Understanding of internal and external direct products.

7. Understanding of the statement and proof of the structure theorem for finite abelian groups, and the ability to determine all possible finite abelian groups of a given order.

Relation to overall program goals

Among other things, this course will (i) enhance your problem-solving skills; (ii) help you recognize that a problem can have different useful representations (graphical, numerical, or symbolic); (iii) increase your appreciation of the role of mathematics in the sciences and the real world.