Math 230b: Algebra

Winter 2016 Course Information and Syllabus

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Lectures: M,W,F 11:00 - 11:50 in Rowland Hall 306.
Office Hours: Wednesday 12:15 - 1:45, RH 540c.
Also, please feel free to email me to set up an appointment.

Course Overview

This course will be a continuation of Math 230a from the Fall quarter which covered group theory and some early topics in ring theory. We will spend the first few weeks giving a more detailed study of rings and their ideals before moving on to study modules. We will give the classification of modules over PIDs and discuss applications to finitely generated abelian groups and normal forms of matrices. We will then begin our study of fields, laying the groundwork for Galois theory, which is covered in Math 230c.

The course will be very similar in style to Math 230a. We will solve many problems throughout the course, both exercises from Dummit and Foote and other sources, and also past qualifying exam problems from UCI and from similar exams at other institutions.

Major Topics

1. Ring Theory
    - Properties of ideals
    - Rings of Fractions
    - Euclidean domains, Principal ideal domains, Unique factorization domains
    - Polynomial rings
    - Gröbner Bases (if time allows)
2. Modules
    - Basic definitions and examples
    - Tensor products
    - Classification of modules over PIDs

Course Texts

The primary textbook will be *Abstract Algebra, Third Edition*, by D. Dummit and R. Foote, but there are parts of the course where we will diverge significantly from it. In particular, I think we will use outside sources for much of our discussion of modules. We will use some supplementary sources incldluing Keith Conrad's notes and *Commutative Algebra* by Atiyah and MacDonald.

Grading

- Homework: 20%
- First Exam (February 22): 20%
- Final Exam (Friday, March 18th 8:00 - 10:00 AM): 60%

As in Math 230a, weekly homework will be a big part of the course. Since there is one fewer exam this quarter it is likely that we will have more homework assignments. I strongly encourage you to start the homework early and to attend office hours if you are having trouble. You are encouraged to work together on problem sets, but **write up your solutions individually**. If you use outside sources (other textbooks, websites, etc.) for your homework, you **must acknowledge them**.

This quarter we will only have one exam instead of having two. If possible I would like this exam to be 90 minutes instead of 50 minutes, so I would like to find a time to have it outside of class. We will schedule this during the first few weeks of class.