Syllabus of Introduction to Abstract Algebra

Related Information

Instructor: You Qi
Time: Every Mon. Wed. Fri. 9:00–10:00am
Venue: 102 Wurster
Office: Room 849, Evans
E-mail: yq2121@berkeley.edu
Office Hour: Mon. Wed. Fri. 10:30–11:30am
Course webpage: `http://math.berkeley.edu/~yq2121/fall2013113.html`

Textbook

We will not have a fixed book. But if you feel like buying one for collection, I would recommend *Abstract Algebra, 3rd Edition* by D. S. Dummit and R. M. Foote, which contains a lot more material than that can be covered in a single course (which, of course, may be useful for research in the future if you are into that kind of nerdy stuff...). Another great reference is M. Artin's algebra book, which is less dry than the above but contains less material.

Schedule

Our basic goal is to cover some basic group theory, ring and module theory. This might be too ambitious a goal, but I believe this is something useful to learn. Of course we'll adjust the speed of teaching as we proceed along. Here is a tentative plan of the staff we'll cover.

1. Basic concepts of group theory: Associative laws. Groups, subgroups. Examples of groups. Equivalence relations. Cosets. Congruence numbers and cyclic groups. Group homomorphisms. Normal subgroups. Isomorphisms. Quotient groups. The correspondence theorem. Free groups. Generators and relations.
2. Group actions and geometry: Isometries. Isometries of two-dimensional real space. Group actions on sets. Cayley's theorem. The counting formula. Actions on cosets. Class equations. Discrete subgroups of isometries. Dihedral groups. Finite subgroups of SO(3).
3. Basic ring theory: Definition of a ring. Polynomial rings. Maps of rings and ideals. Quotient rings. Product rings. Principle ideal domains.
4. Modules: Definitions. Submodules. Maps of modules. Quotient modules. Free modules and presentations. Applications of modules over PID. Introduction to representation theory.

Advice

You are required to attend all the lectures. Since our lectures do not follow any particular text book, and the schedule might change in occasion. As a general principle for taking math courses, *take twice the amount of time of lectures to review what you learnt in class, and do a lot of exercises!* What we hope to achieve is not only the knowledge but also the ability to think logically and independently. Feel free to let me know if some points are unclear to you and ask for more explanations. Any suggestions about the teaching will be warmly welcomed.

In case you have a conflict with any of the exams, please contact the instructor as soon as possible and at least two weeks before the exam. I will schedule a make up exam for you in my office.

Assignments

Homeworks will be assigned every week, and should be turned in on Wednesdays before classes. No late homeworks will be considered. Quizzes and exams will be similar to the examples we do in class and exercises. As another general principle in math, *practice makes perfect*.

Grading

- Homeworks 5 %
- Quizzes, 20 %
- Mid-term, 35 %
- Final, 40 %