Math 103A Fall 2005: Applied Modern Algebra
MWF 2-2:50, Center Hall 222
Professor Daniel Rogalski

1. Contact Information

Prof. Rogalski's Office: 5131 AP&M
E-mail: drogalsk@math.ucsd.edu
Class web site: *www.math.ucsd.edu/~ drogalsk/math103a.html*. Check frequently for updated homework and lecture information.
Office hours: TBA, check website

Section Leader: Cayley Pendergrass, 5018 AP&M
E-mail: cpenderg@math.ucsd.edu
Meeting Times: W 5-5:50 or 6-6:50 in WLH 2115
Office hours: TBA, check website

2. Class Description

This is a first class in abstract algebra. The main topic will be the theory of groups, covering chapters 0-11 of Gallian's book and possibly some additional special topics. Enrollment in Math 109 previously or concurrently is required. It is expected that the students will continue to work to develop their skills in writing proofs in this class.

Homework will be assigned weekly, and due in class on *Monday*, generally covering material up through the previous Wednesday's class. The first assignment is due on 10/1. Late homework will not be accepted, but the lowest two homework scores will be dropped. Wednesday section will provide an opportunity for you to ask questions about that week's homework, to ask other general questions about the material, and to see sample exercises worked in detail. If you would like to meet with me to ask questions but are unable to see me during regular office hours, you may set up an appointment by e-mail to meet at a different time.

There will be 2 in-class midterm exams on Friday 10/14 and Wednesday 11/9 and a final exam on Friday 12/9 from 3-6pm. No calculators, books, or notes can be used during exams. No makeup exams will be given. The final grades will be determined using the following breakdown: homework 20%, midterms 30%, final exam 50%.

3. The textbook

The textbook is very well written— please read it! The book has more examples and details than will fit into the lectures, so I suggest you read the book's treatment of a topic after it is presented in class, but you could also choose to read it before. In any case, the lectures will be designed to complement rather than duplicate the material in the book so both sources are important.

The current edition of the book is the 6th. If you have an earlier edition, that's probably OK because the main part of the text is not much different. However, compare your book frequently to a friend's 6th edition to make sure you aren't missing anything. Also, the exercises may be different or numbered differently so copy the homework problems from your friend's 6th edition.

4. Tentative Syllabus

The following is just a suggested outline of what we will cover when. This is subject to change, and updates to the schedule will be announced in class or posted on the website.

9/23 Introduction to course. Chap 0: Division algorithm, GCDs.

9/26 Chap 0: Modular arithmetic/applications/induction.
9/28 Chap 0: Equivalence relations/functions and terminology.
9/30 Chap 2: Definitions of groups/examples.

10/3 Chap 1: Groups of motions/dihedral groups.
10/5 Chap 2: Elementary properties of groups/ Chap 3: subgroups.
10/7 Chap 3: Examples of subgroups/centers and centralizers.

10/10 Chap 4: Cyclic groups I.
10/12 Chap 4: Cylic groups II/Euler Phi function.
10/14 **EXAM I** covering chapters 0–4.

10/17 Chap 5: Permutation groups/cycle notation/symmetric group.
10/19 Chap 5: Decomposition into 2-cycles/alternating group.
10/21 Chap 5: Applications/check digit schemes.

10/24 Chap 6: Isomorphisms of groups/Cayley's theorem.
10/26 Chap 7: Cosets/Lagrange's theorem.
10/28 Chap 7: Groups of order p and 2p/Fermat's little theorem.

10/31 Chap 8: Direct products.
11/2 Chap 8: Applications including RSA.
11/4 Chap 9: Normal subgroups

11/7 Chap 9: Factor groups/examples.
11/9 **EXAM II** covering chapters 5–(first half of 9).
11/11 **NO CLASS**

11/14 Chap 9: Internal direct products/groups of units
11/16 Chap 10: Homomorphisms.
11/18 Chap 10: Isomorphism theorems.

11/21 Chap 11: Fundamental theorem of abelian groups I.
11/23 Chap 11: Fundamental theorem II.
11/25 **NO CLASS**

11/28 Chap 7: Group actions/orbit-stabilizer theorem.
11/30 Chap 29: Burnside's theorem.
12/2 catchup day or special topic

12/9 Final exam, 3-6pm.