Math 4813, Groups and Representations
Course Information
Spring 2011

Professor: Dr. Lisa Mantini, 410 Math Sciences, email mantini@okstate.edu, telephone 744–5777, web page http://www.math.okstate.edu/~mantini.

Office Hours: Tuesdays and Thursdays from 1:00–2:30 PM; I am generally available after class for at least a half hour, and also by appointment.

Course Times: MWF 8:30 – 9:20 PM in MS 509.

Course Objectives: The aim of this course is to introduce you to my favorite topic in abstract algebra, the theory of groups and their *representations*, or actions as symmetry groups of objects like geometric figures, molecules, or data sets. But I will also try to show you some of the way mathematicians discover interesting ideas through calculation of examples, and I'll try to show you some of the unity of mathematics by including applications to geometry and analysis! This course continues with topics from Linear Algebra and Introduction to Modern Algebra and is an excellent precurser to Modern Algebra I.

Prerequisites: The prerequisite is Linear Algebra as taught in Math 3013. You'll also need "mathematical maturity" or the ability to reason logically and to read and write mathematical arguments clearly, perhaps gained in Math 3613 or another "proof" course. I will summarize facts that we'll use from Math 3613 and from Math 2233 (Differential Equations) as needed.

Texts: There is no purchased text for this course. I will pass out notes as we go along. Your old textbooks from Modern Algebra (particularly the chapter on elementary group theory) and Linear Algebra (particularly eigenvectors and eigenvalues, diagonalization, and change of basis) will be useful. For those who are suitably advanced mathematically, there are graduate texts that may serve as references for this material, primarily *Representation Theory: A First Course*, by W. Fulton and J. Harris, and *Linear Representations of Finite Groups*, by J. P. Serre.

Course Requirements: The written requirements for this course are as follows:

- Homework worth 200 total points.
- Midterm exam worth 150 points. It is tentatively scheduled for late February or early March.
- Final exam worth 150 points. Our scheduled final exam period is Friday, May 6 from 8:00–9:50 AM.
- Final project, a paper to be presented in class during dead week or during our final exam period, and worth 100 points. I will discuss possible project topics later in the course.

Grading: The points assigned during the semester add up to a total of 600 points for the course. Preliminary cutoffs for the final course grade are as follows:

- 540 points (90%) guarantees an A in the course
- 480 points (80%) guarantees a B
- 420 points (70%) guarantees a C
- 360 points (60%) guarantees a D

Homework: Homework will be collected about once every week for most weeks. I expect 8–10 assignments, worth about 25 points each. Late homework is very rarely acceptable and only if approved by me **in advance**. Please prepare your homework on 8.5" by 11" paper, stapled, with no ragged edges. In order to receive full credit your work must be clear and legible, you must show all work, and explanations must be written out in correct English sentences.

Drop Policy: The last day to drop the course with a grade of W is Friday, April 8.

Attendance Policy: Attendance is a part of your course grade only during the student presentations at the end of the semester, but it is very highly recommended at all times. You are responsible for all material covered in class and all assignments. I would prefer you notify me in advance of absences.

Academic Dishonesty: Oklahoma State University is committed to the maintenance of the highest standards of integrity and ethical conduct of its members. This level of ethical behavior and integrity will be maintained in this course. Participating in a behavior that violates academic integrity (e.g., unauthorized collaboration, plagiarism, multiple submissions, cheating on examinations, fabricating information, helping another person cheat, unauthorized advance access to examinations, altering or destroying the work of others, and fraudulently altering academic records) will result in your being sanctioned. Violations may subject you to disciplinary action including the following: receiving a failing grade on an assignment, examination or course, receiving a notation of a violation of academic integrity on your transcript (F!), and being suspended from the University. Carefully read the OSU policy at academicintegrity.okstate.edu.

Specifically, for this course, discussion of the homework with other students is allowed, but you must write up solutions independently. Significant collaborations should be acknowledged. You may not show your written homework to other students before it is turned in, and you may not read solutions written by anyone else before turning your solutions in. In the past at least one exam has been a take-home exam, on which collaboration is not allowed.

Homework assignments: The first few homework assignments are as follows:

Assignment	**Due Date**	**Sections**	**Problems assigned**
1	1/21	1.1	2–7
2	1/28	1.2	1, 4, 6, 8, 10, 11, 13
3	2/4	1.3	1, 3, 5, 6, 7, 9, 11, 13, 15, 17
4	2/11	1.4	1–7
5	2/15	1.5	1, 5, 6, 7, 11, 12, 13, 14, 17, 19