Course Information **Math 572, Fall 2007**

Instructor: Dr. Julie Bergner

Class: MWF 8:30 pm, Cardwell 130
Office: Cardwell 125
Phone: 532-0595
E-mail: jbergner@math.ksu.edu
Course Web Page: http://www.math.ksu.edu/~jbergner/math572.html
Office hours: MWF 8-8:30 am, 2:20-3 pm

Course Objectives: The goal of this course is for you to demonstrate knowledge of geometry at a rigorous level. The specific course objectives are:

1. Students will learn how axiom systems and logical deductions (proofs) provide the foundation of mathematics.
2. Students will learn to read and write proofs.
3. Students will learn the basic ideas Euclidean geometry.
4. Students will learn to conjecture and prove new results.
5. Students will understand geometric transformations.
6. Students will learn basic models and properties of hyperbolic geometry (a non-Euclidean geometry).
7. Students will develop communication skills in presenting mathematics, both in small groups and at the blackboard.
8. Students will learn to use dynamic geometry software.

Format of the course: After introductory discussions on axiom systems and logical deduction, we will work through proofs of selected theorems from the first chapter of *Modern College Geometry* by Davis. Since this book is out-of-print, we will use photocopied handouts. I will begin by proving theorems for the class for a few days, after which you will work in small groups to prove theorems yourselves to share with your classmates. Most of this group work will take place outside of class. During class, groups will be randomly called to the board to share their proofs with the class. Presentations will be critiqued both for mathematical accuracy and communications skill. This will take about half the semester, at the end of which we will have a midterm examination.

The next section of the course will involve using Geometer's Sketchpad, the most popular dynamic geometry software, which is available in the Math-Physics Computer Classroom Laboratory. You will receive instruction on the use of the software, after which you will use the software to explore new geometric situations. You will be asked to conjecture new theorems and then prove your conjectures. We will discuss different ways people come up with conjectures and thus theorems to prove, both with and without software. Geometer's Sketchpad may also be used to understand the properties of conic sections and explore the effects of geometric transformations of various kinds. After these effects are studied experimentally, we can discuss transformation groups, an algebraic approach to understanding these transformations. We will then apply transformation groups in the development of the Poincaré half-plane model of the hyperbolic plane. Once we have a mental image of the hyperbolic plane, we will return to synthetic geometry and see how changing the parallel postulate leads to non-Euclidean hyperbolic geometry and develop proofs of some of the basic results of hyperbolic geometry. We will discuss the deeper role of axiom systems at this time and how mathematicians decide what is a "good" axiom system.

Exams: There will be a midterm exam when we complete the first part of the course. Since you will be doing the proofs yourselves, it is hard to know when this exam will be, but you will have plenty of notice. Make-up exams will only be given under extreme situations. The exams will be given under the honor code. The final exam is scheduled for

Tuesday, December 11, 11:50 am-1:40 pm.

Grading: Grading in this class will be based on class participation, assessments of in-class presentations, homework, in-class exams, and the final examination. Class participation is an important part of the course and you are expected to be present every day. If you cannot attend class, please contact me as soon as possible. Assignments will be given in class during the semester and also posted on the class web site. The grading system for this course is less rigid than for most courses, but for the first part of the course, in particular, you should find this to be to your advantage. For example, the first group to present a proof will be at a distinct disadvantage over the one who has had the opportunity to watch other groups first. While I will be recording scores for each presentation, the main objective is for you to gain a solid understanding of the material, and your grade will reflect that fact. You are welcome to come and ask me about your grade at any time.

Groups: By the end of the first week, you will be asked to form the groups you will be working with for the rest of the semester. Groups should be made up of 3-4 people. When forming a group, you will be asked to give a time and place when you are able to meet with one another on a regular

basis. Different group members should present each time you are called to the board to give a proof.

Notices: Plagiarism and cheating are serious offenses and may be punished by failure on the exam, paper, or project, failure in the course, and/or expulsion from the University.

You will be asked to sign the honor pledge on work that is to be done independently (i.e., exams). In other situations you are permitted, even required, to discuss with one another and refer to other sources, unless otherwise instructed.

Any student with a disability who needs an accommodation or other assistance in this course should speak with me as soon as possible.