Honors 213 Foundations of Geometry

Goals

Non-Euclidean Geometry We will explore the 2000 year history and development of one of the most interesting ideas to arise in western civilization. Our approach will follow that of our author (Greenberg) who uses historical vignettes as motivation and the axiomatic method as the primary tool for understanding the basics of non-Euclidean Geometry.

Reading/Writing It is important that you read the text. In fact, developing the ability to read technical material with understanding is one of the primary goals of this course. Another is to fine-tune the ability to present written arguments clearly and gracefully. It is easier to do this in mathematics than most other disciplines since standard practice in mathematics is to explicitly justify every claim.

Proof Most of this course, either directly or indirectly, deals with the issue of "proof". In particular, you will learn what it means when a mathematician claims to have proven a fact and through the assigned paper, you will explore other notions of proof. Our primary tools for the study of mathematical proof are exactly the same as those used by our author (Greenberg) in his presentation of non-Euclidean geometry: elementary formal logic and the axiomatic method.

Course Information

TEXT *Euclidean and Non-Euclidean Geometries* , Third Edition, Marvin Jay Greenberg, W.H. Freeman and Company, 1993.

TIME 2:00–2:50 P.M. M,W, θ, F

ROOM Thompson Hall 318

INSTRUCTOR Professor Bryan Smith

OFFICE Thompson Hall 321-E

PHONE 879-3562

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OFFICE HOURS
1:00 P.M. - 1:50 P.M.   Mon., Wed., and Fri.
1:30 P.M. - 2:00 P.M.   Thursday

I am also available for meetings at other times. In particular I expect to consistently be available from 3:00 to 3:30 on class days. If you have trouble meeting during office hours please make an appointment for a better time.

EXAMINATIONS There will be three, 100 point, one hour, in-class examinations. Make-up examinations are at my discretion and have the necessary (but not sufficient) condition that you make arrangements prior to the exam. Each examination will be written

so that approximately half of the problems are ones you have seen before. The rest of the exam will involve similar, but new problems. Sufficient interest from the class can change examination dates or move the exams to a 2-hour, evening format. The examinations are tentatively scheduled for the following days:

Examination One	Thursday February 12
Examination Two	Thursday March 11
Examination Three	Thursday April 8

Examinations will consist of problems that are similar to those on the take-home sheets and will be "open book" but not "open note". However you will be allowed to use your copy of my handout of definitions and theorems as a personalized resource for the examinations.

Writing There will be one paper assigned slightly after the midpoint of the semester.

The primary goal of this course is for you to learn the basics of 'mathematical reasoning' or 'mathematical ways of knowing'. You will learn how mathematics addresses the related concepts of proof, communication, meaning, and truth. To provide contrast with mathematical methodology, your paper will examine how some other discipline (your major, minor or some other field of interest) approaches these same fundamental concepts. You can find examples of such papers at

`math.ups.edu/~bryans/Current/journal_toc.html`.

Clearly this material begs for entire books rather than a paper written in 2-4 weeks, so keep your topic focussed. The primary goal of the paper is for you to investigate how some other discipline deals (or doesn't) with such philosophical fundamentals as: proof, communication, or truth.

Paper Logistics

Due March 12: Last day to have a topic accepted. Merely turning in a topic on this date does not guarantee it will be accepted. You should meet with me before this to discuss possible topics. Don't wait until the last minute.

Due April 1: Turn in 3 copies of a draft of the paper (please print on both sides to save paper). I will distribute 2 of those copies to your referees. (This means each of you will referee two papers.) The referees will read the paper for accuracy, clarity of exposition and appropriateness for the *Journal of Undergraduate Mathematics at Puget Sound* as outlined in the *Journal* Guidelines for Authors (see the class web page for details).

Due April 15 Referees give their reports to authors.

Due April 22: Turn in the final version of the paper along with all referee comments. If the paper receives a passing grade, it will be published in the journal.

The author will receive a grade for the paper itself and the referees will receive grades for the quality of their comments.

Course Information Updates If you wish, after every examination (and at other requested times) I will post a report on your current standing in the class on my university web page. You should keep track of your grades on the various assignments and check

them against these reports. If there are any discrepancies they should be dealt with immediately.

FINAL EXAMINATION The Final will be cumulative but will be weighted more heavily on the material covered since the third in-class examination. It is scheduled for **Thursday May 13, 2004 from 12:00 until 2:00 P.M.** Please note this schedule and do not plan to leave town until after the final.

HOMEWORK There will be homework assignments every week. Problems will be graded on content and accuracy. One-third to one-half of the problems will be outlined in class and will also be graded on clarity of exposition. When you prepare the problems that are outlined in class, think of them as writing assignments because they will be graded as such. Remember, they are expository papers written in support of a claim you are making about the validity of your argument. Think of these take-home problems as officially assigned papers in which you completely explain your analysis of the problem. At the very least you should write these problems:

- Using complete sentences
- In the first person plural
- With accurate punctuation
- For an audience consisting of students not in this class but with an equivalent background
- In a clear, easy to follow expository style

Feel free to use (or not) any technology that you like (e.g., CABRI, Geometers Sketchpad, calculators, *Mathematica*, MATLAB, etc.). You may also work with others in solving these problems but there is to be no collaboration in the writing of the solutions. Moreover, you must cite each resource you use. This includes: technological tools, texts read, participants in discussions and anything else other than your own thoughts. Citations are to occur in the text proper (in-line) except for your list of discussants which should appear on the cover page. Do not use footnotes or endnotes except in exceptional circumstances. Remember, failure to include references is intellectual theft!

TOTAL POINTS

Homework	45%
Paper	12%
Referee Reports	3%
Examinations	30%
Final Examination	10%

First Assignment (Due Friday January 23) Find my university web page

(http://math.ups.edu/ → faculty → Bryan Smith)

and locate the *Journal of Undergraduate Mathematics at Puget Sound* "Guidelines for Authors" page. Then send an e-mail message to me at bryans@ups.edu indicating that you have an account, understand how to access the World Wide Web, and are aware of how to avoid mistakenly sending e-mail to Beverly Smith that is meant for Bryan Smith.