MATH 300, Non Euclidean 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 the standard practice 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 your 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

Non EUCLIDEAN GEOMETRY MATH 300-A Spring Semester 2003

MATH 300-A	Geometry	10:00 A.M.	M,T, W , F
Bryan Smith	Thompson 321-E	756-3562	bryans@ups.edu

ROOM Thompson 320

OFFICE HOURS

9:00 A.M. - 10:00 A.M.	Monday, Tuesday, Wednesday, and Friday
10:00 A.M. - 11:00 A.M.	Thursday (PROBLEM SESSION)

I am also happy to meet at any other time we can arrange. You can set up an appointment after class, by phone or with e-mail.

TEXTBOOK

Euclidean and Non-Euclidean Geometries, 3rd Edition, Greenberg, ©1993, W.H. Freeman and Company

Science/Math majors should consider obtaining a scientific word processor.

COURSE CONTENT The formal prerequisite for this course is Calculus 122. This means you should be familiar with the basic methods and techniques for thinking about and solving mathematical problems. However, the actual topics covered in calculus will not occur in this course until chapters 7 and 9. Most of the semester will be spent following an axiomatic treatment of Euclidean and hyperbolic geometry and, time permitting, will finish with a brief overview of Felix Klein's transformational approach. The axiomatic approach is called 'synthetic' geometry while Klein's approach is currently referred to as 'modern' geometry.

Geometry is a proof-based course offered by the mathematics department and as such fulfills both the university's "Writing in the Discipline" and the department's contract major writing requirements. In fact, a large portion of this course will be devoted to determining, and putting into practice, what it means to 'prove' a mathematical statement. This means there will be at least as much focus on providing detailed explanations of **why** the mathematical tools work as on when, where and how to use them. Hence, in all of your work, you will provide clear justifications for each and every step of your written argument. Remember this when you are writing up your projects.

READING Developing an ability to read and understand a (relatively) technical piece of writing is a primary goal of this course. This skill is fundamental not only for those who wish a career in science but also for anyone who wishes to be an "educated" member of society. Hence, careful reading of the texts is an integral part of this course — especially since lectures will not be word-for-word reiterations of the material in the textbook. I recommend multiple readings of the material as we cover it since technical material is extremely difficult to grasp quickly.

HOMEWORK There will be homework assignments almost every day. All 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.

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 at the end of your paper. Do not use footnotes or endnotes except in exceptional circumstances. Remember, failure to include references is intellectual theft!

It is best to 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

Since most of you are either science or mathematics majors, you should use a word processor to write your papers. The equation editor in Microsoft Word is acceptable but there are numerous other options available. My own preference is *Scientific Notebook* since its native format for files is TEX(the standard format for publishing papers in mathematics and most hard science. Use double spacing and avoid fonts smaller than 12 point. If you prefer to work by hand, I expect your written work to be in ink.

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	Tuesday February 11
Examination Two	Tuesday March 11
Examination Three	Tuesday 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.

FINAL EXAM The Final will be cumulative but will be weighted more heavily (about 1/3) on the material covered since the third in-class examination. It will be held in our classroom on

Monday May 12, 2002; 4:00 P.M. - 6:00 P.M.

Please note this schedule and do **not** plan to leave town before the scheduled time for the final.

GRADING The different aspects of the course will be weighted according to the following:

Homework	55%
Examinations	30%
Final Examination	15%
TOTAL	100%

First Assignment (Due Friday) 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.