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- Classes:** MWF 10:30–11:20, Benson 115
- Web site:** www.math.washington.edu/~lee/Courses/444-2009
From the Math Dept. home page, **Class Web Pages** → **Math 444A**
- Textbooks:** (*available for purchase in the U Bookstore, and on reserve in the Math Library, PDL C-306*)
Gerard A. Venema, *The Foundations of Geometry*, Pearson Prentice Hall, 2005
Dana Densmore (ed.), *Euclid's Elements*, Green Lion Press, 2002
Harold Jacobs, *Geometry: Seeing, Doing, Understanding*, 3rd ed., W. H. Freeman, 2003
- Prerequisites:** Grades of 2.0 or better in Math 126, 308, and 300 (formerly 310).
- Exams:** Midterm: Wednesday, February 11, in class.
Final: Monday, March 16, 8:30–10:20.

GENERAL DESCRIPTION

This course is designed for people who expect to be teaching geometry at the high school or middle school level, but it can be useful for many others as well.

Mathematics is the single field of human endeavor in which we are the most certain of the correctness of our knowledge. How can we be so certain? It is because mathematicians have developed a rigorous system for *proving* mathematical assertions, starting from simple assumptions and progressing by simple logical steps whose legitimacy virtually everyone can agree on. This system, together with the many mathematical insights that have been gained from it, is among the crowning intellectual achievements of humanity.

Geometry is the first branch of mathematics that humans managed to systematize and place on a rigorous footing, and it has served as a model for rigorous logical thought for more than two millennia, as well as being one of the most practically useful branches of mathematics.

The main goal of this course is to help you acquire a deep understanding of and appreciation for geometry, and learn to think about it rigorously. This is a math course, not a course in pedagogy—thus I won't be teaching you “how to teach geometry”; that's something you'll have to learn from education courses and hands-on practice. But in order to be a successful teacher, you need to have what the experts call “profound understanding of elementary mathematics.” In this course, most of the mathematical topics we discuss will be rather elementary, but our approach will be far from elementary.

A secondary goal of this course is to help you become adept at mathematical communication. Opportunities to improve your communication skills on several levels will arise throughout the course (see below for details): speaking precisely about mathematical ideas in class; writing informally about mathematical ideas on the Geometry Blog; writing careful mathematical arguments for homework assignments; and writing polished expositions of mathematical ideas for your final portfolios. If you pass the course *and* receive an overall score of 70% or better on the writing aspects of the course (portfolio and blog), you will get “W-course” credits for Math 444 and Math 445.

Here are the main topics for 444/445: critical reading of Euclid; critical reading of a high-school geometry text; introduction to and comparison of different axiom systems for geometry; in-depth study of the most important results of Euclidean geometry and their proofs; comparison of intuitive, graphical, verbal, and axiomatic ways of understanding geometry; an introduction to the history and main results of non-Euclidean geometries.

REQUIREMENTS

Classes: Although I won't keep a formal attendance record, *I expect you to attend every class*. Sometimes I'll introduce new concepts and techniques that are not covered in the reading. Sometimes there will be unannounced quizzes. If you will miss a class for a religious holiday, let me know in advance and I'll arrange to get you a summary of the lecture and any materials you missed. If you must miss a class for some other unavoidable reason, it's your responsibility to find out what happened, and get your homework to me by class time (or, in case of emergency, as soon as possible thereafter).

Geometry Blog: I've set up a Math 444 Geometry Blog, accessible from the class website. I will try to post a blog entry as soon as possible after every class—usually, my entries will be ready by about 4:00PM, sometimes sooner. Each of my blog entries will include a brief summary of what happened that day (no substitute for attending class!), the latest reading and written assignments, and some questions for you to address in your own blog entries. Part of the requirement for this course is to post a blog entry of your own, in response to mine, before the next class. Your posts won't be graded for quality, but for full credit you must respond to at least two posts a week, and your entries must address the questions I pose in my own posts. In addition, I encourage you to bring up any questions that have been raised in your mind by the latest reading, lecture, and/or homework, and to respond (respectfully!) to questions or comments made by other students. Please don't just repeat what others have written; instead, try to contribute something new to the conversation. If you wish to write about specific homework problems, please confine your comments to general questions and suggestions about how to get started.

Reading: Most of my blog posts will include reading assignments. They will be from the required books or from the handouts that I will prepare, and will usually correspond to material that will be discussed in the next class or two. I expect you to read through each assignment quickly before the next class, and then to reread it carefully after it is covered in class. All reading assignments are required.

Written Homework Assignments: Most of my blog posts will also include written homework assignment. Depending on the nature of the assignments, they might be due at the next class, or they might be due later. Homework will not be accepted after the due date except in extraordinary circumstances and (except for emergencies) with advance permission. I encourage you to work on the homework problems together with other students. However, when you write up your solutions to hand in, *you must write your own solutions in your own words*. More details about how to write up homework assignments will be given in an upcoming handout.

Quizzes and Exams: In addition to an in-class 50-minute midterm and the regularly scheduled final exam, I will give short quizzes at sporadic intervals throughout the quarter. These will often be simply homework problems that you've already done, which I will ask you to answer in a timed setting without looking at your notes. Other times, they will be short questions that test how well you've absorbed the reading, or the concepts and definitions that have been discussed recently. Not all quizzes will be announced in advance. Quizzes cannot be made up, but your lowest quiz score will be dropped, and any quiz missed for religious or medical reasons (with a doctor's note) will not count against you.

Writing Portfolios: Some of your written homework problems will be designated as "Portfolio Problems," usually after they've been graded and returned to you. You'll revise and rewrite the solutions to the portfolio problems, with feedback from other members of the class, the TA, and/or me. After a couple of rounds of revision, you'll come up with a final version to keep in your portfolio. At the end of the quarter, you'll turn in a completed writing portfolio for a grade.

GRADES: Your grade for the quarter will be based on a weighted average of the following score:

- 20% Homework assignments
- 10% Quizzes
- 5% Blog posts
- 15% Writing portfolio
- 20% Midterm exam
- 30% Final exam

Individual homework and quiz scores will be recorded as percentages, and the lowest homework score and lowest quiz score will be dropped before averaging the rest.