

## Topics in geometry for teachers (preliminary syllabus)

Math 431.001, Fall 2008

MWF 1–2 PM

Although this is a course for potential high school teachers, it is not the goal of this class to teach you *how to teach*. Instead, we are trying to obtain insight into the background and development of the *material* you will be teaching. We will start this course with the rudiments of Euclidean geometry, with which you are probably familiar.

Many people's high-school educations include proofs of geometric facts involving distance, angles, and proportionality, using tools that go by names such as side-side-side and vertical angles. Rather than leaping in and producing such proofs without motivation, we are going to take a step back and ask: What is distance? What is an angle? Can you define these terms without descending into self-referentiality? What does it *mean* to define them?

It turns out that the answers to these questions lead us naturally to the idea of axioms and proofs; and, once we have these ideas, we can go far beyond Euclidean geometries — for example, to non-Euclidean geometries. It is the goal of this course to develop in us the ability to understand, formalise, and reason with geometric concepts. We will start with a quick review of Chapter 1 in the text, and then cover as much as time permits of Chapters 2–4, and parts of Chapters 5 and 9.

Chapter 2 is an introduction to the rudiments of logic and proof. Writing *and reading* rigorous proofs will be an important part of the course. Chapters 3 and 4 discuss different ways of answering the question: What are the objects (points, lines, angles, &c.) of Euclidean geometry “really”? Chapters 5 and 9 provide, respectively, a more advanced perspective on systems of geometry that look different from Euclid's; and a different way of looking at geometry (the *Erlanger program*) that changes the focus from what the objects of geometry *are* to what we can *do* to them.

### Course policies:

- Cell phones are to be turned off during class.
- Unless otherwise stated, all answers on assignments and exams must be justified. A correct answer with no justification will earn minimal partial credit.
- You are *allowed* and *encouraged* to work with others on the homework, but you *must* write up your own solutions.
- Calculators are not allowed on the exams.
- Late homeworks will not be accepted.
- Make-up exams will not be given.
- You must notify me of any conflict with an exam at least a week in advance of the scheduled time. Travel arrangements are *not* a sufficient excuse. (Don't buy a plane ticket for December 11.)

*Please see other side for important administrative information.*

## Topics in geometry for teachers (preliminary syllabus)

Math 431.001, Fall 2008

MWF 1-2 PM

### Instructor contact information:

- Name: Loren Spice
- E-mail: [lspice@umich.edu](mailto:lspice@umich.edu). Please include the string '431' in the subject of any mail to this address.
- Office: 1851 EH
- Office phone: (734) 763-2423
- Office hours: Monday, 9–10 AM and Wednesday and Friday, 4–5 PM

**Required text:** Euclidean and non-Euclidean geometries, by M. Greenberg.

**Course web page:** <http://www.math.lsa.umich.edu/~lspice/class/431/F2008>.

This web site will contain

- up-to-date announcements and information about the class,
- homework assignments,
- handouts, and
- an anonymous feedback form. (In order to allow me to respond to them, comments will be treated as public unless otherwise requested.)

It should be checked regularly.

**Homeworks:** The homework assigned on classes up to and including any particular Monday will be due by the end of class on the following Monday. For example, the homeworks assigned on Wednesday, 10 September, Friday, 12 September, and Monday, 15 September are all due on 22 September.

**Grading:** You are guaranteed an A (possibly  $\pm$ ) for a score of 90% or higher, a B (possibly  $\pm$ ) for a score of 80% or higher, and so on. It is likely that these thresholds will be lowered (but not raised) at the end of the course.

- Homework: 15%;
- First exam: 20%;
- Second exam: 25%; and
- Final exam: 40%.

Grades will be posted on CTools (at <http://ctools.umich.edu>) as they are available.

**Exams:** The first midterm will be held in class on 10 October. The second midterm will be held in 4088 EH, 8–10 PM, on 12 November and 13 November. You are free to attend whichever seating of the second exam is more convenient. If you have any conflicts with these dates, please let me know at least a week in advance. Conflicts will be considered on a case-by-case basis. The final exam will be held Thursday, December 11, 4–6 PM, in a location to be announced.

*Please see other side for information about the course structure and policies.*