

Math 130 Review for final exam

Material covered

The final exam is comprehensive, with a slight emphasis on the material covered since the midterm: Projective geometry, Transformation groups, and Hyperbolic geometry. Our main reference for this material was Stillwell, chapters 5 – 8 (we skipped some of Chapter 6). Additional readings, and those for the first half of the course also, are listed on the course website.

Format

The exam will be similar in format to the midterm. It will only be slightly longer than the midterm. You should be able to finish it in 2 hours, although you are welcome to use all 3 hours of the scheduled time. **You will be given statements of axioms** if you are asked to prove anything from axioms.

Suggestions for a big-picture review of the course

- Re-read the review of Hartshorne's book that you were assigned on the first week of class. Which of the various facets of geometry mentioned in the review did we cover? Which did we emphasize the most? Having learned some geometry, do you think the reviewer missed anything? Having read several sections of Hartshorne's book, do you agree or disagree with the points made in the review?
- Read the review of Stillwell's book here: <http://www.jstor.org/stable/40378384> (you need to be on campus to download the article from this link). It gives a nice, though rather opinionated, chapter-by-chapter summary of the book. What would you add to such a review to make it a more accurate description? What do *you* think are the most important results covered in the book?
- Look at the *week-by-week list of readings and activities* on the course webpage. Add to it by writing a brief summary of what you learned from class and the readings that week (e.g. what are the most important definitions, theorems and ideas?)

Practice problems

- Make sure you can do all the problems from the homework and from the midterm exam. Do these first before attempting anything else!
- **All of the problems** from the sections that we covered in Stillwell are quite reasonable, and will help you understand the content of the section. They are very good practice!
- Pick a proposition from book 1 of the *Elements* at <http://aleph0.clarku.edu/~djoyce/elements/bookI/bookI.html> and critique it: is Euclid making any unfounded assumptions?
- Hartshorne, problem 2.5 (page 24). (you can try other constructions on that page if you feel you need more practice)
- Why can you trisect a line segment, but not an angle, with straightedge and compass?
- Hartshorne 6.2, 6.4, (challenge: 6.9 – this is similar to the “winning the lottery with projective geometry” idea)
- Hartshorne 7.2, 7.8, 8.1, 8.3, 9.1.
- After reviewing hyperbolic geometry and linear fractional transformations, work through the proofs of *two involutions* and *three reflections* in Stillwell, section 8.8. Fill in any missing details.