math 5200/7200 fall 2009: room304, 10:10am; Smith: Boyd 448, 11:15-noon; or by appointment: contact me at 2-2595, roy@math.uga.edu, rcsmith99@gmail.com
Prerequisites: math 3200(proofs/logic), math 3000(linear algebra).

Welcome to math 5200/7200, foundations of geometry. In roughly the first half of the course, we will read the first 4 books of Euclid, including basic theorems on congruence of triangles, areas of rectangles and triangles including Pythagoras and its generalization the law of cosines, properties of tangents, arcs, and chords of circles, and construction of regular polygons of 3,4,5,6 sides. This will be concurrent with reading Hartshorne's ch. 1 as commentary. The role of the parallel postulate will be given special attention, with a view toward the study of "non Euclidean" geometries where it fails to hold, but Euclidean geometry is our primary focus.

As we read Euclid, we will work exercises from Hartshorne to strengthen our grasp of the concepts, and will also examine Euclid's proofs for logical completeness, noting any gaps we observe. We will end our review of Euclid with some familiar related theorems that Euclid omitted, as in Hartshorne, ch.1.5.

Then we will study briefly the system of axioms given by Hilbert in 1899 to fill Euclid's logical gaps, as presented in Hartshorne ch. 2, and mention alternative approaches, such as Birkhoff's ruler and protractor postulates in 1932 based on properties of real numbers.

Finally we want to examine the relationship of plane geometries to systems of numbers called "fields" in modern algebra, noting those algebraic properties that correspond to Hilbert's geometric axioms. We will learn that the real number field provides one model for Euclidean geometry, that many other fields do so as well, and we will learn which geometric properties are peculiar to Euclidean geometry based on the real numbers.

We may modify this outline as we go, e.g. as to how much time we spend on each topic, but we will try to at least state all the main results. We will try to spend enough time on the first part for a mastery of the classical results of Euclid's geometry as he presented them. There will be written homework, tests, and class presentations by students. We will not treat in detail the technicalities of similarity and area, but will state their main properties, and mention how they may be justified, if time permits.

We will have 3 tests and one final exam; attendance is required, in particular at these. three or more unexcused absences may result in a W or WF. Dates of tests may change, but the final exam will not be moved, so check your exam schedule for confilcts now.
http://www.reg.uga.edu/or.nsf/html/Fall_Exam_Schedule_2009
Tests: I-Sept.18,2009; II-Oct.16,2009; III-Nov.20,2009, (last day before Thanksgiving!)
Exam: Wed. Dec 16, 8am-noon.

Grade: no lower than: 60%tests,15%hw/presentations, 25%exam. Grad students should expect extra assignments and/or higher test standards.
We will follow the UGA academic honesty policy as it appears on the web.