Mathematics 120
Fall, 2009

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Hours: M 6:30–8:00p; Tu-F 2:00–5:00p. Appointments welcom.

Course Content: Mathematics 120 is an introduction to pure mathematics through the study of geometry. This term we will use as a theme the role of infinity in the development of mathematical thought.

Texts: The ones preceded by an asterisk (*) should be purchased in the bookstore by **September 13**!

*Plato, *Meno,*, Focus Publishing (trans. by Anastaplo and Berns).

Aristotle, *Physics,* excerpt.

Euclid, *Elements,* Book I.

Galileo, *Dialogues Concerning Two New Sciences,* excerpt.

*Descartes, *Geometry,* Dover.

Saccheri, *Euclid Freed of All Blemish.*

Lobachevsky, "Geometrical Researches on the Theory of Parallels."

Hilbert, *Foundations of Geometry,* excerpt.

Einstein, *Geometry and Experience.*

Escher, *Circle Limit* series.

Course Goals: After this course, the student should have developed the following capacities: to reason about geometry and numbers, to read with greater attention to detail, to understand the elements of two of the classical liberal arts, geometry and number theory (arithmetic), to discuss differences in the ancient and modern conceptions of these arts. This course is for the purposes of liberal education. Thus its goals are the highest possible in a mathematics course. (Xylander, who produced the first German translation of Euclid in 1562 in which many of the proofs were omitted, tells us that his book was meant for the simple amateur who is of course content to know the facts without knowing how to prove them. But you are not mere amateurs. You are liberal arts students.)

Tests: Two tests will be offered. The first is currently planned for the second week in February in class. The second test will be announced a week in advance. Students are expected to take tests at the scheduled times. Any conflicts or problems will be handled on an individual basis. If a student has an excuse deemed legitimate by the instructor, arrangements will be made to take the test **prior to** the scheduled time.

Commentaries: Commentaries are **due each week on Friday**, excepting weeks in which there is a test and the first week. Each is to be two pages, typed, double-spaced, of a 12-point font. Each is to comment on the ideas in the course covered in the previous week or so. Each may provide alternate explanations of things, probe issues which cause the student confusion, amplify or clarify the successes or failures of the text, or anything which shows serious thought about some part of the course. A comment is more than an off-hand reaction like "It was interesting." A comment is to be critical or questioning, wondering or insightful, coherent and focused. Outside sources are permitted but not encouraged; keep in mind that each commentary will be evaluated on the quality of the student's own reflections. If outside sources are used, be sure to cite them appropriately and to avoid plagiarism as defined in the Honor Code. Unsatisfactory commentaries must be rewritten to receive credit.

Class Participation: The work done in the class meetings is part of the course work for each student. Absences and tardiness must be counted as work not done. Further each person is to be ready to participate in each class conversation. Students will be expected to present proofs at the blackboard unaided by notes or the text. Responsibility will rotate in random order throughout the whole class.

Class conversation, including conversation in class and in the LearnLink conference, needs to follow certain guidelines, if it is to be productive. Each person must feel free to contribute. This requires each person to be open to and willing to explore other's opinions. This is not to say that every person's opinion is equally valid. But every opinion, seriously proposed, equally merits investigation until we all can see in what ways it is valid and in what ways it is not. Let us keep in mind that there is not necessarily only one correct opinion, and that opinions are not necessarily strictly correct or incorrect. Usually there are ways in which an opinion is correct and ways in which it is not. We should respond to what others say and refer to whom we are responding. To remind us to be civil and polite, we should use formal address, "Ms" or "Mr" plus the name. A sign of a good conversation is that it makes us want to reread the text.

Quizzes: All quizzes are announced; some may be take-home. The student must be present in class to receive a quiz unless a **prior** arrangement has been made with the instructor.

Final Examination: There will be a comprehensive final examination at the time scheduled by the registrar.

Grades: Grades will be based roughly on the following distribution of work:

Tests	20%
Class Participation	35%
Commentaries	25%
Final Examination	20%

The plus/minus system will be used. If the class becomes particularly small, then class participation will count more (up to 40%) and commentaries will count less.

Homework: Rereading. I want to point out to you at the outset the importance for you, both in this course and particularly in your future life, of the development of skill in reading. Reading is more than sounding out and recognizing words. It is more than putting the words in a sentence together to get the meaning. The deepest reading is ever mindful that the text was written by a human for a human audience and with human purposes in mind. A sensitive reader will discover these purposes, and see what evidence there is in the text that the author has these purposes and why. All this requires rereading.

Mathematical writing usually lacks the poetical subtleties of irony and metaphor, but it does have its own difficulties. Words, phrases, definitions, and logic are used precisely, and the ideas fit together precisely. This requires the reader to pay close attention to detail and have a good memory. You must practice these things. The reader needs to follow the *logic* of the argument. One must pay attention to the scope of the hypotheses, that is, when the text assumes some statement and when the text stops assuming it. The subtle differences in the words "would/will" and "could/can" are important.

A resource:

- Carl Boyer, *History of Mathematics*. For information about Euclid, noneuclidean geometry, Lobachevksy. Quite readable.

Honor Code: The Honor Code of Oxford College applies to all work submitted for credit in this course. By placing your name on such work, you pledge that the work has been done in accordance with the given instructions and that you have witnessed no Honor Code violations in the conduct of the assignment.