Prerequisite: At least one year of university-level calculus (yes, you really do need this background)

What’s on this syllabus?

Page 1: The four required books
Page 2: Written assignments and grading algorithm
Pages 3-5: Course calendar, reading assignments, policies on lateness and electronics

The Four Required Books


Note especially in the required text:
the pronunciation guide in the index at the end of Katz’s book; this is empowering.
the general bibliography on p. 542
the historical timeline pp. 529-35 linking the history of mathematics to general history
the material on pages 521-528 with suggestions on using history of mathematics in the teaching of mathematics.


4. Jacques Hadamard, *Psychology of Invention in the Mathematical Field* (Dover pb)

Lectures will focus on specific topics, and will reflect the instructor’s view of what is most important; Katz will provide an excellent overview of each topic and a wealth of examples.

There will be discussions on the books numbered 2, 3, and 4. Of course questions in lecture are welcome, as consistent with the size of the class.
Written assignments:

“Intelligent Sentences” Assignment: Read the week’s reading before each Monday’s class. Hand in two intelligent sentences on the reading for the coming week, covering different parts of the reading. These will be handed in at the START of class, peer-graded during the last 5 minutes of class, then collected by the instructor. I’ll briefly review them and hand them back on the following Wednesday.

Sample good sentences and not-so-good ones (two of each, you should be able to tell which is which):

1. Leibniz, inventor of the calculus, lived in Germany.
2. Leibniz’s major contribution to calculus was really his mathematically suggestive notation, since conceptually Newton’s calculus would have been good enough.
3. Euclid was an important predecessor of Archimedes, who drew on the work of Euclid who lived earlier.
4. Although both Euclid and Archimedes gave logical proofs in geometry, Archimedes was willing to use less rigorous methods to discover the non-obvious results he later proved.

Random peer grading: Assign each “sentence” a letter grade, and write a brief comment explaining your grading. Samples:

1. A grade. You’ve explained clearly how proof and problem-solving interact in the work of Archimedes.
2. B grade. Deals with substantive issues but not clearly enough worded – not clear what you mean by “the way Archimedes approaches mathematics”?
3. C grade. These are just individual facts that one could look up.
4. D grade. You don’t address the actual reading, but just rephrase the title of the first section of the chapter.
5. F This is a blank piece of paper.

These “sentences” will constitute 15% of your course grade, and doing them will help you be an intelligent discussant and lecture listener. Try to enlighten your peer grader.

NOTE: This is a pass/fail assignment; peer grades are for your information.

Problems and Essays: Each week, due at the start of class on Wednesday (except the first week), 50% of the course grade. For both (a) and (b), GIVE THE PAGE AND QUESTION NUMBER!

(a) Every Wednesday at the start of class (except for the first week and the 13th and 15th weeks), hand in:

the solution of three problems from the current week’s reading from Katz (your choice; it’s most valuable if you pick the hardest ones you can reasonably do; Do not “share” this assignment with another student; work on your own): 2/3 of this component (1/3 of course grade). Grader graded.

(b) Every other Wednesday (last name A-M the even-numbered weeks, last name N-Z the odd-numbered weeks), at the start of class:

your answer to one of the discussion questions in the previous two weeks’ reading from Katz (again, your choice; pick something that interests you. Do not “share” this assignment with another student; work on your own). “Discussion questions” are at the end of the problems; it should be clear which is which. One to two double-spaced pages usually is appropriate. 1/3 of this component (1/6 of course grade). These questions are like what you’ll find on the final examination. Graded by the professor.

You must type (b). As for (a), if you don’t know how to use TeX, at least make (a) as legible as possible. The grader will hand your problem back ungraded if it is too hard to read.

(ii) Women in Mathematics brief assignment. This will happen on Monday, December 2. Guidelines will be handed out.

(iii) Final Examination
The final will combine short answers and essays. There will be some choice. Study questions will be provided ahead of time.

Grade algorithm: Problems & essays 50%, Women in Math 5%, Intelligent Sentences 15%, Final 30%.
Tentative Calendar:

<table>
<thead>
<tr>
<th>Dates</th>
<th>Topic and Assignments</th>
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<tr>
<td></td>
<td>(My “Recommended” books are for your personal further education)</td>
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Week 1 (9/4): **Introduction to the course.**
READ THE SYLLABUS (it’s a contract between us), look at pp. 521-543 of Katz.

Week 2 (9/9 and 9/11):
**Mathematics in ancient Egypt**
Read Katz, 1 – 9,

**Babylonian mathematics**
Katz, 10 – 25, 29 - 36

**Recommended:** H. Frankfort, Before Philosophy; O Neugebauer, Exact Sciences in Antiquity
M. Ascher, Ethnomathematics; A. Aaboe, Episodes from Early Mathematics.


Week 3 (9/16 and 9/18):
**Early Greek mathematics from Pythagoras to Euclid; Greek mathematics and philosophy; Introduction to Euclid**
Plato, Meno (all) for Monday. Monday’s class will be a discussion
Katz, 36-62.

**Recommended:** David Fowler, The Mathematics of Plato's Academy, Wilbur Knorr, The Evolution of the Euclidean Elements. The Elements of Euclid are on line and well worth looking at (try his proof of the Pythagorean Theorem, Book I, Proposition 47). Full table of contents of this is at [http://aleph0.clarku.edu/~djoyce/java/elements/toc.html](http://aleph0.clarku.edu/~djoyce/java/elements/toc.html)

Week 4 (9/23 and 9/25): **More on Euclid; Archimedes**

**Recommended:** Same books as last week, and also T. L. Heath, ed., The Works of Archimedes; E. J. Dijksterhuis, Archimedes (2d ed. is better because it has an updated bibliography); Reviel Netz & William Noel, The Archimedes Codex

Week 5 (9/30 and 10/2): **Apollonius, Ptolemy, Hellenistic Mathematics, Greek Astronomy, Diophantus, Pappus, and Hypatia**


Week 6 (10/7 and 10/9): **China and India**


Week 7 (10/14 and 10/16) **Mathematics in the Islamic World**
Monday: Katz, 161-188. (Recommended reading on next page)

Mathematics in the Latin Middle Ages

Week 8 (10/21 is fall break)

The Renaissance

Week 9 (10/28 and 10/30)

Mathematics in the Scientific Revolution; Analytic Geometry: Fermat and Descartes
Monday: Katz 242-251; Wednesday, Katz 257-278.

Week 10 (11/4 and 11/6) Descartes’ philosophy and 17th-century mathematics before the calculus
Read Descartes, Discourse on Method, all, for class discussion on Monday November 4

Week 11(11/11 and 11/13): Newton and Leibniz invent the calculus; 18th-century analysis
A. R. Hall, Philosophers at War: The Newton-Leibniz Controversy
T. L. Hankins, Science and the Enlightenment; William Dunham, The Calculus Gallery: Masterpieces from Newton to Lebesgue; William Dunham, Euler: The Master of Us All

Week 12(11/18 and 11/20): More on 18th-century analysis; Rigorization of the calculus.

Week 13(11/25): Mathematical creation
For class discussion on Monday: Read Jacques Hadamard, Psychology of Invention in the Mathematical Field Class will not meet on Wednesday Nov. 27. Use the time to prepare for Dec. 2 discussion.

Week 14(12/2 and 12/4): Women in Mathematics: Class discussion on Dec. 2.
Handout and brief written assignment, 5% of your total grade; more details forthcoming. Your instructor was on the committee of the Mathematical Association of America which published a “Women in Mathematics” poster and readings, from which part of the assignment will be taken. It’s in the hall upstairs in Fletcher, between Fletcher & Scott.

Wednesday  **Topics in 18th- and 19th-century mathematics**

Choose one of these chapters in Katz’s book:

13: Probability & Statistics in the 18th century
14: Algebra and Number Theory in the 18th century
15: Geometry in the 18th century

**Recommended:** Jacqueline Stedall, *From Cardano to Lagrange*. Also see Katz’s suggestions in each chapter.

**Final Examination:** Thursday, December 19, 2 PM

**Late work (without compelling reason) docked 10% per CALENDAR day.**

**Policies on electronics:**

1. I identify with those who prefer to take class notes using a computer, and will begin the semester by allowing you to do this. But please do not text, email, or use the Web during class, and make sure you turn off the sound on your computer (and cell phone, Skype, and other devices and software).

2. Papers need to be handed in on paper. I can’t print out 47 separate assignments each week, or give you any kind of feedback without a pencil and paper.

**Student Learning Objectives:**

Students who have completed this course successfully should be able to do these things:

1. Ask and answer significant questions about the history of mathematics. More precisely:
   - Describe the major mathematical developments over time in the cultures of Egypt, Babylonia, Greece, Medieval China, Medieval India, the Medieval Islamic world, the European Middle Ages, the Renaissance, and the seventeenth, eighteenth, nineteenth, and twentieth centuries in Europe and the Americas;
   - Be able to describe the development of number systems, geometry, proof, algebra, analytic geometry, the calculus, and the foundations of mathematics, across cultural and national lines;
   - Be able to explain the relationship between the development of mathematics and social, philosophical, religious, and scientific developments;
   - Be able to solve a range of mathematical problems, from calculus and from more advanced types of mathematics, from the societies whose mathematical history is covered in the course.