GREAT THEOREMS:
THE ART OF MATHEMATICS

Honors / Math 411G, Spring 2009
`http://www.math.nmsu.edu/~history/`

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Nature of the course: This upper division mathematics course is based entirely on the philosophy of direct study of primary historical sources in mathematics. The primary focus is on the mathematics: however, although it is not labeled as a history of mathematics course, the mathematics is set entirely in historical context, so the history is a constant companion and students will learn a lot of history in the context of learning specific mathematics. Each course offering is based on a sequence of primary sources designed for studying one or more great topics in mathematics. The course textbook *Mathematical Masterpieces: Further Chronicles by the Explorers* provides the primary sources, along with extensive annotation, contextual historical and mathematical commentary, and mathematical exercises for students. There are four independent chapters on great themes in mathematics:

- The Bridge Between Continuous and Discrete
- Solving Equations Numerically: Finding Our Roots
- Curvature and the Notion of Space
- Patterns in Prime Numbers: The Quadratic Reciprocity Law.

Each offering of the course typically covers one or two of these topics.

This course counts toward either the major or minor in mathematics; it also qualifies for the university general education upper division "Viewing a Wider World" requirement.

Typical upper division students in the course are majoring in mathematics, engineering, computer science, or the physical sciences.

The course has been offered yearly since 1988.

About course materials: The website `http://www.math.nmsu.edu/~history/` provides much more information about the course and materials, including sample sections from each chapter.

Prerequisites: Grades of B or better in MATH 192 (Calculus II) and any upper division MATH/STAT course, with overall GPA of 3.2 or better, or consent of instructor.

	Written homework assignments:	50%
Course Grade:	Term Paper:	25%
	Class Participation:	25%

The ancient Greeks counted arithmetic and geometry among the Seven Liberal Arts. Adopting the view of mathematics as art, we will examine the creation of some mathematical masterpieces from antiquity to the modern era. A careful analysis of these theorems and their original proofs will illustrate the aesthetic spirit which pervades mathematics; a comparison with modern theorems and methods will demonstrate the progress mathematics achieves through abstraction.

We will also place the theorems in a larger historical context, since mathematics is an inseparable part of human history, effecting profound changes in people's lives, and itself responding to new social and political needs. Finally, as these theorems were discovered by real flesh-and-blood people, it is only appropriate to look at how their lives and work were influenced by the intellectual and social environment of the day.

The text contain the primary sources and theorems we will study. We have endeavored to provide the original proofs of these theorems, in order to present the most authentic possible picture of the evolution of mathematics during a long span of time. In class we will discuss and interpret these theorems and their proofs, and we hope for lively discussion involving everyone. As we examine the development of mathematical ideas, we will also discuss their historical context and the biographies of their creators. Regular written assignments based on the original mathematical sources will consist of proving related results, filling in missing parts of proofs, and related historical questions. One of our main aims is to have students actually do mathematics themselves by creating some ideas and devising proofs on their own.

In addition to the regular assignments there will be a term paper based on library research into a mathematical topic chosen with instructor advice and approval. As the semester goes along, students should be looking for a topic for the term paper, perhaps related to what we do in class. By midsemester students should have chosen the paper's topic. Near the end of the semester, after the written paper is finished, each student will give a brief class presentation to tell everyone else what they explored and discovered.