# Class Syllabus

#### MATH 4367, Evolution of Mathematics

Dr. Ken W. Smith, Sam Houston State University Fall 2017, Section 01 (CRN 81103) M & W, 10-10:50, in LDB 205; Friday sessions are 10-10:50 in LDB 403.

Catalogue description: An introduction to the historical development of fundamental mathematical ideas from antiquity to the present.

**Textbook:** Howard Eves, An Introduction to the History of Mathematics (6th edition.) This textbook is out of print and so students will be given *free* pdf copies of the relevant chapters.

# 1 An exciting subject!

Welcome to the Evolution of Mathematics, MATH 4367, at Sam Houston State University!

Mathematics without history is mathematics stripped of its greatness: for, like the other arts

– and mathematics is one of the supreme arts of civilization –

it derives its grandeur from the fact of being a human creation.<sup>1</sup>

Most of us have assumptions about mathematics and how it developed. In those assumptions, we lose track of the excitement, the creativity – and the confusion – involved in the development of mathematics. And so we lose sight of the beauty and structure of mathematics!

Anyone interested in teaching mathematics should understand how mathematics developed. The stages of development give insight into the common difficulties in learning the various levels of mathematics. Primitive societies knew what our third graders know; the Greeks knew our "high school" mathematics, yet it took over a thousand years for human society to progress from Euclid's "geometry" to Newtons "calculus"! But when the calculus was introduced, the world changed!

In this class we will examine the broad panorama of mathematics beginning with primitive times and ending with the European Renaissance and the development of calculus.

# 2 Professional expectations

This class is designed for individuals who intend to use mathematics professionally, applying it in industry or teaching it in secondary or tertiary education. (Most of you plan to teach mathematics! The rest of you will have a profession involving mathematics in some way.)

Students in this class are expected to view themselves as *professionals*, with a professional curiosity about the subject and a professional pride in their work. Student involvement in the lectures and discussions is a critical component in this course. Students must be actively involved in the learning process during the lecture/discussion period.

Please view this class as you would any other *professional* responsibility!

During Fall 2017, as part of our professional commitment to mathematics, we will be collaborating with the students in MATH 3380, taught by Dr. Dustin Jones, which also meets on a MWF schedule at 10 am. On certain Fridays we will combine those classes in LDB 403, with students from each class teaching the others! Please treat those Friday sessions as you might treat some future inservice workshop. View yourself as a professional mathematician, not as a student! © Engage with the other professionals, asking questions, contributing to discussions.

<sup>&</sup>lt;sup>1</sup>G. F. Simmons, in Differential Equation with Applications and Historical notes, 1991, quoted in the November 1997 issue of the American Mathematical Monthly.

On some Fridays, you will be one of the presenters!

We will meet in LDB 403 every Friday, even if we are not in a combined session.

## 3 Grades

Grades will be based on class involvement and examinations. Class involvement includes written homework, material posted on Blackboard, occasional quizzes, and one or two in-class presentations. There are two exams and a comprehensive final exam

The knowledge base for this class is a mixture of mathematics and history and so problems will include mathematical computations and essay questions about mathematics and its development.

An A grade in the class is about 88% or higher on the total points. A B grade is 78% or higher on the total points. (Students with a professional attitude who meet the prerequisites for this class should be able to achieve at least a B grade.) A passing grade (C/D) requires at least 65%.

**Homework.** There will be homework collected each class period. Homework should be written up with professional care and pride.

Quizzes. There will be 4 to 6 quizzes, worth 25 points each. Most Fridays will include a quiz covering the recently discussed material.

**Calculators.** We will be studying the development of mathematics from about 600 BCE to about 1700 CE. Since calculators were not developed until the 1980s (!) most of work will *not* involve caculators.

Calculators are not allowed on any classwork. (Nothing we do requires a calculator; every topic is from a period long before the invention of the calculator!)

**Exams.** There are two exams in the class and a final exam.

- 1. Exam 1 is **Monday, October 9**, over Parts 1 & 2 of this course.
- 2. Exam 1 is **Monday, November 20**, over Parts 3 & 4 of this course.
- 3. The final exam is Monday, December 4, 10:30 am-1:00 pm. It is comprehensive.

Blackboard & other communications. Class material will be posted on Blackboard. Students should have a Blackboard email address and read that address regularly. Syllabi, notes, quiz solutions and other material will often be provided by email, as pdf files. (These files can be opened by Adobe Reader; see <a href="http://get.adobe.com/reader/">http://get.adobe.com/reader/</a> for a free copy of that software.)

Class periods will involve discussion of relevant course material. Students should read/watch lesson material *prior* to coming to class. Student participation in that discussion is essential. Students should also participate in discussions on Blackboard.

My e-mail address is <u>KenWSmith@shsu.edu</u>. I read my e-mail daily. My office hours are immediately after class each day. If these hours are inconvenient, feel free to make an appointment for another time. My office is LDB 421E.

# 4 A comment on writing

Professional mathematicians do a great deal of writing about the subject. As you write, practice good mathematical grammar and exposition.

Any writing submitted by a student (including daily worksheets) must either be the student's creation or must be a quotation. Quotations must be submitted within appropriate quotation marks and must be appropriately cited. Quotations should not exceed more than 10 percent of the submitted writing. All other writing – that is, work which is not within quotation marks – must be the personal creation of

the student author. Submitted work that is not within quotation marks, but which is not the creation of the student author, is considered plagiarism. (If you are unsure whether your submission might be considered plagiarism, please speak to me. I am an experienced writer and an experienced teacher and I would like to help.)

Express yourself in your writing; explore your topic! Write creatively. Enjoy your work!

The format of electronic submissions should either be in one of the following formats: LaTeX, Word, or pdf. Electronic submission in LaTeXis encouraged.<sup>2</sup> When a piece is submitted electronically, it should include the students last name on both the files filename and also on the top line of the internal document.<sup>3</sup>

# 5 My commitment

This is an exciting course with exceptional material. I want you to succeed and do well! You may discover that this class is one of the most significant and exciting courses in your professional career – that is my hope!

Please feel free to talk to me. I want you to enjoy this class and I want you to do well!

A tentative schedule is attached, as an appendix.

Dr. Ken W. Smith,

Sunday, August 20, 2017

 $<sup>^2</sup> See \ \underline{\text{http://en.wikibooks.org/wiki/LaTeX}} \ \text{or} \ \underline{\text{http://www.tug.org/texlive}} \ \text{for descriptions of Tex/LaTex.}$ 

<sup>&</sup>lt;sup>3</sup>For example, I might submit a paper with filename Smith\_EulerBiography and would write "Ken W. Smith" on the first line of the term paper.

#### MATH 4367 Schedule

Fall 2017 (Tentative)

### Part 1, Before the Greeks

- 1.1 Wednesday, August 23, Numbers in Primitive Societies
- 1.2 Friday, August 25, Bases and Radix Notation
- 1.3 Monday, August 28, Babylonian Mathematics
- 1.4 Wednesday, August 30, Egyptian Mathematics
- 1.5 Friday, September 1, Primitive Algebra & Quiz I
- ⇒ Monday, September 4 (No class: Labor Day Holiday)

### Part 2, Greek Mathematics

- 2.1 Wednesday, September 6, Thales and Pythagoras
  - \* Friday, September 8, Group Discussion, II
- ⇒ Friday, September 8, Last day to drop and receive full refund
- 2.2 Monday, September 11, Euclidean Tools
- 2.3 Wednesday, September 13, Euclid's Elements, I
  - \* Friday, September 15, Group Discussion, II
- 2.4 Monday, September 18, Euclid's Elements, II
- 2.5 Wednesday, September 20, Greek Number Theory
- 2.6 Friday, September 22, After Euclid & Quiz II
- 2.7 Monday, September 25, Greek Age, Conclusion
- 2.8 Wednesday, September 27, Limits to the Axiomatic Method
  - \* Friday, September 29, Discussion, III

#### Part 3, The Quiet Millenium

- 3.1 Monday, October 2, Early Mathematics of China
- 3.2 Wednesday, October 4, Early Mathematics of India
  - \* Friday, October 6, Group Discussion, IV
- $\implies$  Monday, October 9, Exam 1, over Parts 1 & 2
- 3.3 Wednesday, October 11, Mathematics of Arabia
- 3.4 Friday, October 13, Mathematics of Medieval Europe & Quiz III
- 3.5 Monday, October 16, Fibonacci

## Part 4, Mathematics of the Renaissance

- 4.1 Wednesday, October 18, Italy in the Sixteenth Century
  - \* Friday, October 20, Discussion V
- 4.2 Monday, October 23, Solving the Cubic
- 4.3 Wednesday, October 25, The Dawn of Modern Mathematics
  - \* Friday, October 27, Discussion VI
- 4.4 Monday, October 30, Fermat, Pascal and Descartes (in the Seventeenth Century)
- 4.5 Wednesday, November 1, Number Theory in the Seventeenth Century
- 4.6 Friday, November 3, Early Geometry & Quiz IV
- 4.7 Monday, November 6, Renaissance Science
- 4.8 Wednesday, November 8, Almost Calculus
  - \* Friday, November 10, Discussion VII
- ⇒ Friday, November 10, is the last day to drop the class with a Q grade.

## Part 5, The Calculus Age

- 5.1 Monday, November 13, Newton
- 5.2 Wednesday, November 15, Leibniz and the Bernoullis
  - \* Friday, November 17, Discussion VIII
- $\implies$  Monday, November 20, Exam 2, over Parts 3 & 4
- ⇒ Wednesday, November 22 & Friday, November 24, Thanksgiving Holiday,
- 5.3 Monday, November 27, Euler
- 5.4 Wednesday, November 29, Rigor and Uncertainty
  - \* Friday, December 1, Discussion IX
- ⇒ Monday, December 4, Final Exam, 10:30 AM -1:00 PM.

  This exam is comprehensive.

Last modified on Aug 20, 2017.