Math 419   Historical Perspectives of Mathematics   Summer 2024

Instructor   Amites Sarkar

Text   A Concise History of Mathematics
                            Dirk Struik

Syllabus

I'll cover a selection of topics from the origins of counting to the invention of calculus.

Overview

It has been said that the insights of one generation become the instincts of the next. Subjects such as differential calculus were once a secret art understood only by a coterie of specialists – today they are taught to millions of people worldwide every year. The famous mathematician Louis Mordell once wrote:

Mathematical study and research are very suggestive of mountaineering. Whymper made several efforts before he climbed the Matterhorn in the 1860's and even then it cost the life of four of his party. Now, however, any tourist can be hauled up for a small cost, and perhaps does not appreciate the difficulty of the original ascent. So in mathematics, it may be found hard to realise the great initial difficulty of making a little step which now seems so natural and obvious, and it may not be suprising if such a step has been found and lost again.

This is precisely what makes the study of the history of mathematics both interesting and difficult. We have to try to get inside the minds of people who thought in a very different way and who did not have access to intellectual tools that we take for granted. A good example of such an intellectual tool is the number 0.

Class activities

Expect lectures, discussions and problem solving.
Occasionally, we will watch a video.

Grading

There will be no exams, but you are responsible for reading the parts of the book corresponding to the topics covered, for attending and participating actively in each class, and for the writing assignments, which I'll discuss in more detail in class. This is a Writing Proficiency course, so the majority of your grade will be based on the quality of your writing and the clarity of your ideas and arguments. Specifically, your grade will be based on the following:

Term paper draft	15%
Term paper	35%
In-class writing assignments	15%
Homework and presentations	35%

Course objectives

The successful student will demonstrate an understanding and appreciation of:

- The development of mathematics as a creative human activity

- The evolution of mathematical ideas over time

- The structure and rigor of mathematics as viewed from a historical perspective

- The relationships between different parts of mathematics

- The importance of primary sources

Chat GPT and other generative AI models

I might show some examples of this in class, but you are not allowed to use generative AI models to write your term paper.

Office hours

My office hours are 11:15am–noon on Mondays, Tuesdays, Wednesdays and Thursdays, in 216 Bond Hall. My phone number is 650 7569 and my e-mail is amites.sarkar@wwu.edu

Tentative weekly schedule

Week 1
Introduction; definitions of mathematics; pure and applied mathematics; the origins of writing and counting; some ancient civilizations; comparison of different number systems

Week 2
Egyptian arithmetic and geometry; early Greek mathematics; Thales; the Pythagoreans; Pythagorean triples; Zeno, Eudoxus and Hippocrates; Plato's Academy; the Museum at Alexandria; Euclid's Elements

Week 3
Euclid's number theory; Eratosthenes and the Earth; Aristotle, Aristarchus and the Moon; Ptolemy's Almagest; Archimedes; Diophantus, Pappus and Hypatia; Constantinople

Week 4
Aryabhata, Brahmagupta, Mahavira, Bhaskara; Al-Biruni; Europe in the 1300s; the battle of the scholars - del Ferro, Fiore, Tartaglia, Cardan and Bombelli

Week 5
Al-Khwarizmi on quadratics; Cardan on cubics; Ruffini, Abel and Galois; examples of good mathematical writing, and what we can learn from them; Galileo; Tycho Brahe and Kepler; Descartes

Week 6
Newton; Leibniz; the "problem of the points" as solved by Fermat and Pascal