

MATH 304: ELEMENTARY NUMBER THEORY

Instructor:

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Office Hours: Wednesday 1.00-3.00

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Number theory is the study of the arithmetic properties of numbers. In this course, we will start from the basic properties of the integers and proceed through some of the classic topics of number theory: the fundamental theorem of arithmetic, the theory of congruences, Mersenne primes, primitive roots, continued fractions, Pell's equation and Diophantine approximation. Our main goal of the course will be an understanding of the quadratic reciprocity theorem of Gauss. Time permitting, we will explore some more advanced topics later on.

Number theory is both immediately accessible and remarkably subtle. Unlike your previous experience with differential calculus, number theory doesn't rely on big machinery (like integration) or fundamental theorems. Rather, it is a collection of loosely connected techniques. It is more a way of thinking than a single unified subject.

While number theory is one of the oldest branches of mathematics, contemporary research continues to explore deep phenomena that underly classical results. I will try to provide a historical viewpoint on this progression, framing the content with both its historical roots and how it has inspired current thought.

Text. A Friendly Introduction to Number Theory, 3rd ed., Joseph Silverman, Prentice-Hall (ISBN 0-13-186137-9).

I also recommend the following additional texts. These are suggested alternatives to the main text but are not required:

An Introduction to the Theory of Numbers, G.H. Hardy.

Number Theory for Beginners, André Weil.

A Classical Introduction to Modern Number Theory, Ireland and Rosen. (more advanced)

Assignments, Exams. There will also be weekly homework assignments. You are encouraged to work on homework together, but you must write up your homework individually. There will be a midterm exam and a final exam.

Grading. Your grade will be determined by the following weighting scheme:

30% – Homework and Participation

30% – Midterm Exam

40% – Final Exam

I expect you to comport yourself with honor, as derived from respect for the academic program, your peers and your instructors. Academic dishonesty will be punished severely.