

# Introduction

*Introduction and overview of Math 2137, Algebra and Coordinate Geometry for Teachers, Spring 2019.*

## Course Objectives

This course integrates the various types of numbers introduced in the previous course to present them as members of a single (real) number system. The notion that new numbers are discovered as solutions to equations is promoted, and motivated by connecting various equations with mathematical models.

Matrices are introduced and used as linear transformations, mainly in the plane. The complex numbers are introduced as general solutions to quadratic equations and the relationship between complex arithmetic and transformations in the plane is explored.

The course finishes with several weeks of geometry content for middle grade teachers, including more material on proofs, triangle congruence, and non-Euclidean geometry. The main example is “Taxicab geometry”, based on the  $\ell_1$  norm.

## Topics

- Polynomial arithmetic as “base- $x$ ” and binomial theorem
- Real number system
- Polynomial equations and their roots
- Exponential and logarithm functions
- Complex numbers
- Matrices
- Complex arithmetic and linear transformations in the plane
- Geometry proofs
- Taxicab geometry

## Learning Goals

- Understand polynomial arithmetic from the perspective of place value.
- Unified perspective on the real number system, including situations modeled by different numbers, and numbers as solutions to equations.
- Familiarity with complex numbers and matrices from algebraic and geometric points of view.
- Awareness of non-Euclidean geometries and the importance of the parallel postulate.
- Ability to create and evaluate geometric proofs.
- Identify major historical developments in algebra and number systems including contributions of significant figures and diverse cultures.