

Algebra 2, Part 1

Course Outline & Objectives

Course Description:

In Algebra 2 Part 1, students will deepen their understanding of equations and inequalities, including multi-step, absolute value, and systems of equations. They will analyze and graph linear functions, interpret slope and intercepts, and explore relationships between parallel and perpendicular lines. Students will solve systems using substitution, elimination, matrices, and Cramer's Rule. The course also introduces operations with matrices and determinants. Building on this foundation, students will solve and graph quadratic equations using methods such as factoring, completing the square, and the quadratic formula. They will learn about complex numbers and apply them in solving equations. Finally, students will perform operations with polynomials, factor polynomial expressions, and analyze the structure and behavior of polynomial functions.

Credits - One Semester (0.5 Carnegie unit / CA: 5 credits) | Prerequisites: Algebra 1; Geometry

Course Outline

Unit 1: Linear Equations, Inequalities, and Systems

- 1.1 Solving Equations and Inequalities
- 1.2 Solving Absolute Value Equations and Inequalities
- 1.3 Slope and Writing Linear Equations
- 1.4 Graphing Linear Equations and Inequalities
- 1.5 Solving Systems of Equations Graphically
- 1.6 Solving Systems of Equations Algebraically
- 1.7 Solving Systems of Inequalities
- 1.8 Linear Programming

Unit 2: Advanced Systems and Matrices

- 2.1 Systems of Equations in Three Variables
- 2.2 Matrix Operations
- 2.3 Matrix Multiplication
- 2.4 Determinants
- 2.5 Cramer's Rule
- 2.6 Inverses of 2x2 Matrices
- 2.7 Solving Systems Using Matrices

Common Core Standards

In Unit 1 students will:

Solve multi-step linear equations and inequalities, including those with absolute values.
Analyze and graph linear equations and inequalities using slope, intercepts, and standard forms.
Write linear equations given points, slopes, or contextual information, and interpret parallel and perpendicular relationships.
Solve systems of equations and inequalities using graphing, substitution, and elimination methods.
Apply systems of inequalities and linear programming to optimize real-world scenarios.

[A-CED, A-REI, F-IF]

In Unit 2 students will:

Solve systems of linear equations in three variables using substitution and elimination.
Perform operations with matrices, including addition, subtraction, scalar multiplication, and matrix multiplication.
Calculate determinants and use Cramer's Rule to solve systems of equations.
Find the inverse of 2x2 matrices and use inverse matrices to solve systems.
Solve systems of equations using augmented matrices, Gaussian elimination, and Gauss-Jordan elimination.

[A-CED, A-REI, N-VM]

Course Outline

Unit 3: Functions

- 3.1 Functions and Continuity
- 3.2 Features of Functions
- 3.3 Sketching Graphs of Functions
- 3.4 Piecewise Functions
- 3.5 Parent Functions and Transformations
- 3.6 Operations on Functions
- 3.7 Even and Odd Functions
- 3.8 Inverse Relations and Functions

Unit 4: Quadratic Functions

- 4.1 Quadratic Functions
- 4.2 Solving Quadratic Equations by Graphing
- 4.3 Complex Numbers
- 4.4 Solving Quadratic Equations by Factoring
- 4.5 Solving Quadratic Equations by Completing the Square
- 4.6 The Quadratic Formula and the Discriminant
- 4.7 Curve Fitting with Quadratic Models
- 4.8 Quadratic Inequalities
- 4.9 Linear-Quadratic Systems

Unit 5: Polynomial Functions

- 5.1 Operations with Polynomials
- 5.2 Graphing Polynomial Functions
- 5.3 Factoring Polynomials
- 5.4 Dividing Polynomials
- 5.5 Solving Polynomial Equations by Factoring
- 5.6 Solving Polynomial Equations Algebraically
- 5.7 Zeros and Roots of Polynomial Functions
- 5.8 Pascal's Triangle and the Binomial Theorem

Common Core Standards

In Unit 3 students will:

Explore the concept of functions, including domain, range, continuity, and function notation.

Analyze function graphs to identify key features such as intercepts, extrema, intervals of increase/decrease, and end behavior.

Interpret, sketch, and transform various parent functions and piecewise-defined functions.

Perform operations with functions, including composition, and classify functions as even, odd, or neither.

Find and verify inverse functions algebraically and graphically.

[F-IF, F-BF]

In Unit 4 students will:

Analyze quadratic functions in various forms to identify key features such as vertex, axis of symmetry, and maximum or minimum values.

Solve quadratic equations using multiple methods including graphing, factoring, completing the square, and the quadratic formula.

Perform operations with complex numbers, including simplifying, adding, subtracting, multiplying, and dividing.

Model real-world scenarios with quadratic functions using regression and interpret their graphs and solutions.

Graph and solve quadratic inequalities and systems involving linear and quadratic equations.

[N-CN, A-SSE, A-REI, F-IF]

In Unit 5 students will:

Perform operations with polynomials and apply exponent rules to simplify expressions.

Graph polynomial functions and analyze their end behavior, turning points, and key features.

Factor polynomials completely using a variety of techniques, including special products and factoring by grouping.

Solve polynomial equations algebraically and graphically, and interpret their solutions.

Explore the Binomial Theorem and Pascal's Triangle to expand binomial expressions and identify specific terms in expansions.

[N-CN, A-SSE, A-APR, F-IF]