

Algebra IIA

SCOPE OF COURSE

This course is divided into two semesters of study (A & B) comprised of five units each. Each unit teaches concepts and strategies recommended for intermediate algebra students. The first half of the course (A) addresses linear equations and functions, systems of linear equations and inequalities, quadratic functions, polynomial functions and their graphs, and power functions and inverses.

SEQUENCE OF SKILLS

UNIT 1 – Linear Equations and Functions

- Perform operations with real numbers
- Simplify and evaluate algebraic expressions.
- Use linear equations to solve problems
- Rewrite equations and formulas to solve for a given variable
- Apply formulas in problem solving
- Analyze problems and write equations to solve them
- Determine when a relation is a function
- Graph and evaluate linear functions
- Find the slope of a line given its graph or two points on the line
- Classify pairs of lines as parallel, perpendicular, or neither
- Understand slope as a rate of change
- Graph an equation using slope-intercept form
- Graph an equation that is in standard form
- Write an equation of a line given its slope and y-intercept, the slope and a point on the line, or two points on the line
- Use an algebraic model to make a prediction given a set of data
- Graph piecewise functions
- Solve absolute value equations
- Graph absolute value functions

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SEQUENCE OF SKILLS

UNIT 2 – Systems of Linear Equations and Inequalities

- Solve linear inequalities
- Solve absolute value inequalities in one variable
- Graph linear inequalities
- Write linear inequalities
- Solve a linear system graphically
- Determine whether a system has zero, one, or many solutions by observing the graph
- Use the linear combination method
- Use the substitution method
- Determine algebraically whether a system has zero, one, or many solutions
- Apply linear systems to realistic situations
- Graph a system of two inequalities in two variables
- Graph a system of three inequalities in two variables
- Describe the difference between bounded and unbounded regions
- Find minimum and maximum values of an objective function
- Use linear programming to solve problems in realistic situations
- Identify the octant in which an ordered triple is located
- Locate an ordered triple in three-dimensional space
- Write the ordered triple that corresponds to a given point in three-dimensional space
- Use the linear combination method to solve a system in three variables
- Determine whether a system has zero, one, or many solutions
- Apply systems in three variables to realistic situations
- State the dimensions of a given matrix and name its entries
- Identify row, column, square, and zero matrices
- Add and subtract matrices
- Multiply a matrix by a scalar
- Use matrices to represent realistic situations
- Recognize when it is possible to multiply two matrices
- Multiply two matrices
- Verify the properties of matrix multiplication
- Use matrix multiplication in realistic situations
- Evaluate determinants of 2×2 and 3×3 matrices
- Use the determinant of a matrix to find the area of a triangle on the coordinate plane
- Convert a system of linear equations in two variables into a matrix equation
- Solve a system of linear equations in two variable using a graphing calculator
- Apply matrices to solve systems in two variables in realistic situations using a graphing calculator
- Convert a system of linear equations in three or more variable into a matrix equation
- Solve a system of linear equations in three of more variables using a graphing calculator
- Apply matrices to solve systems in three or more variables in realistic situations using a graphing calculator

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SEQUENCE OF SKILLS

UNIT 3 – Quadratic Functions

- Recognize that the graph of a quadratic function is a parabola
- Identify the vertex and the axis of symmetry for a parabola by observing its graph
- Determine whether a quadratic function is written in standard form, vertex form, or intercept form
- Graph a quadratic function in standard form, vertex form, or intercept form
- Explore some realistic applications of quadratic functions
- Identify monomials, binomials, and trinomials, and recognize that these are all polynomials
- Factor a trinomial of the form $x^2 + bx + c$ or $ax^2 + bx + c$
- Recognize and factor a difference of two squares or a perfect square trinomial
- Check to see if the terms of a given polynomial have a common monomial factor
- Solve quadratic equations by factoring
- Solve realistic problems using quadratic equations
- Recognize that solutions, zeros, x -intercepts, and roots are all related
- Discover that the maximum or minimum value of a quadratic function is the average of its zeros
- Find the zeros of a quadratic function by factoring and writing the function in intercept form
- Find the zeros of a quadratic function using a graphing calculator
- Understand and use the properties of square roots
- Apply the properties of square roots to solving quadratic equations
- Verify the solutions of a quadratic equation both algebraically and by using a graphing calculator
- Use quadratic functions to model falling objects
- Discover that some parabolas do not cross the x -axis and therefore have no real solutions
- Understand the definitions of an imaginary number, complex number, and pure imaginary number
- Solve quadratic equations with imaginary solutions
- Add and subtract complex numbers
- Multiply complex numbers
- Recognize complex conjugates and discover that the product of complex numbers is always a real number
- Divide complex numbers
- Explore the powers of i and discover a pattern
- Simulate the process of completing the square using algebra tiles or sketches
- Complete a perfect square trinomial and write it as the square of a binomial
- Solve quadratic equations by completing the square
- Write the vertex form of a quadratic function by completing the square, given the standard form
- Find the maximum value of a quadratic function by completing the square
- Given a graph of a quadratic function, select an equation in vertex form that represents the graph
- Determine whether a quadratic function has two real solutions, one real solution, or two imaginary solutions by examining its graph
- Apply the quadratic formula to solve quadratic equations with two real solutions, one real solution, or two imaginary solutions
- Identify the discriminant of a quadratic equation and use it to determine the number and nature of the functions' solutions
- Choose the most appropriate method for solving a quadratic equation: factoring, square roots, quadratic formula, or graphing calculator
- Apply quadratic equations to realistic solutions
- Review graphs of linear inequalities
- Given a quadratic inequality and its graph, choose several points inside and outside the parabola to determine which ones satisfy the inequality
- Match a quadratic inequality with its graph
- Graph a quadratic inequality
- Explore realistic applications of quadratic inequalities
- Graph a system of quadratic inequalities
- Solve a quadratic inequality by graphing
- Solve a quadratic inequality algebraically
- Explore some more realistic applications of quadratic inequalities
- Write a quadratic function in vertex form, intercept form, and standard form given information about its graph
- Produce a quadratic function that models a given set of data
- Find the best-fitting quadratic model for a set of data using a graphing calculator

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SEQUENCE OF SKILLS

UNIT 4 – Polynomial Functions and Their Graphs

- Evaluate and simplify expressions with exponents
- Apply scientific notation to solve realistic problems
- Identify and evaluate polynomial functions
- Use synthetic substitution
- Graph a polynomial function
- Determine the end behavior of a graph
- Add and subtract polynomials vertically and horizontally
- Multiply polynomials
- Apply special product patterns
- Factor polynomial expressions using the sum or difference of cubes
- Factor polynomials by grouping
- Apply factoring to solve polynomial equations
- Solve polynomial equations in realistic situations
- Divide polynomials using long division
- Divide polynomials using synthetic division
- Find rational zeros of polynomial functions
- Find rational zeros of polynomial functions with the assistance of a graphing calculator
- State the number of solutions or zeros of a polynomial function
- Write polynomial functions using zeros
- Solve realistic problems using polynomial models
- Graph a polynomial function using x -intercepts
- Analyze the graph of a polynomial function

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SEQUENCE OF SKILLS

UNIT 5 – Power Functions and Inverses

- Identify the index of a given radical
- Evaluate the n^{th} root of real numbers using radical notation
- Identify the number of real roots of a given real number
- Rewrite the n^{th} roots using rational exponential notation
- Evaluate expressions with rational exponents
- Solve an equation using an n^{th} root
- Use n^{th} roots and rational exponents to solve realistic problems
- Simplify expressions using the properties of rational exponents
- Simplify expressions using the properties of radicals
- Write radicals in simplest form
- Add and subtract roots and radicals
- Identify a power function
- Graph a power function using both paper/pencil and the graphing calculator
- Add and subtract two functions
- Multiply and divide two functions
- Use function operations in a realistic situation
- Find the composition of two functions
- Find the inverse of a linear function numerically and algebraically
- Graph a linear function and its inverse
- Find the inverse of a nonlinear function
- Graph a nonlinear function and its inverse
- Graph the inverse of a function using the graphing calculator
- Determine if two functions are inverses using the graphing calculator
- Graph a square root function
- Investigate the effect of changing a in a function of the form $y = a\sqrt{x}$ using a graphing calculator
- Graph a cube root function
- Investigate the effect of changing a in a function $y = a\sqrt[3]{x}$ using a graphing calculator
- Use a radical function in a realistic situation
- Solve a simple radical equation
- Solve an equation with rational exponents
- Solve an equation with one radical
- Solve an equation with two radicals
- Solve an equation with extraneous solution(s)