Mathematics Department

Course: Advanced Algebra with Trigonometry

Advanced Algebra with Trigonometry is designed for students who have successfully completed an Algebra II course and wish to further develop a foundation in mathematics in preparation for further college coursework in math and related fields of study. Students who have demonstrated strong competency in Algebra II and students who have experienced difficulties in Advanced Algebra II may select this course. This course incorporates the extended study of advanced algebraic topics with introductory trigonometry. This course will require students to review and extend important algebraic concepts from previous courses to further study function theory and families of functions. These functions will include linear, polynomial, rational, exponential, logarithmic, and trigonometric functions. Equation solving, graphing, and problem solving are emphasized throughout the course. Successful completion of this course will be measured through teacher-generated assessments, projects, and assignments. This course can be counted in partial fulfillment of the state-mandated fifteen (15) credits of mathematics. The units referenced from this course's Scope and Sequence that follows references an extensive review of Algebra 2 concepts followed by five units from the Pre-Calculus curriculum.

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Effective: September 2023

Scope and Sequence

The Scope and Sequence for this course references an extensive review of Algebra 2 concepts followed by parts of the first five (out of 10) units of the Pre-Calculus Curriculum.

Month	Advanced Algebra with Trigonometry
September	**Review of Prerequisites** - Recognize subsets of the real numbers - Use inequality symbols - Evaluate absolute value - Use absolute value to express distance - Evaluate algebraic expressions - Identify properties of the real numbers - Simplify algebraic expressions - Understand and use integer expressions - Use properties of exponents - Simplify exponential expressions - Use scientific notation

	- Evaluate Square roots - Use the product tule to simplify square roots - Use the quotient rule to simplify square roots - Add and subtract square roots - Rationalize denominators - Evaluate and perform operations with higher roots - Understand and use rational exponents - Understand the vocabulary of polynomials - Add and subtract polynomials - Multiply polynomials - Use FOIL in polynomial multiplication - USe special products in polynomial multiplication - Perform operations with polynomials with several variables - Factor out the greatest common factor of a polynomial - Factor by grouping - Factor trinomials - Factor the difference of squares and perfect square trinomials - Factor the sum and difference of cubes - Use a general strategy for factoring polynomials - Factor algebraic expressions containing fractional and negative exponents - -Specify numbers that must be excluded from the domain of rational expressions - Simplify rational expressions - Add, Subtract, Multiply, and divide rational expressions - Simplify complex rational expressions
October	**Unit 1: Families of Functions and Their Graphs (Pre-Calc Unit 1)** - Use graphs to determine intercepts - Interpret information given by graphs - Solve, write, and graph linear equations - Recognize equations of horizontal and vertical lines - Find the equations of horizontal and vertical lines - Solve problems using formulas - Use linear equations to solve problems - Solve for a variable in formula - Add, subtract, multiply, and divide complex numbers - Perform operations with square roots of negative numbers - Solve Quadratic Equations by factoring, square rooting, completing the square, and the quadratic formula - Use the discriminant to determine the number any type of solutions - Determine the most efficient method to use when solving a quadratic equation - Solve problems modeled by quadratic equations - Solve polynomial equations by factoring - Solve radical equations

	- Solve equations with rational exponents - Solve absolute values equations - Solve inequalities (Linear, Quadratic, Rational)
November	**Unit 1: Families of Functions and Their Graphs (Cont)** - Find the domain and range of a relation - Determine whether a relation is a function - Determine whether and equation represents and function - Evaluate a function - Find and simplify a functions difference quotient - Understand stand and use piecewise function - Find the domain of a function - Graph functions by plotting points - Obtain information about a function from its graph - Use the vertical line test to identify functions - Identify intervals on which a function increases, decreases, or is constant - Find a functions average rate of change - Identify if a function is even/odd functions and recognize their symptoms - Recognize graphs of common functions - Use vertical and horizontal shifts to graph functions - Use reflections to graph functions - Use vertical stretching and shrinking to graph functions - Graphing functions involving a sequence of transformation - Combine functions arithmetically, and determine domains - Form composite functions - Determine domains for composite functions - Write functions as compositions - Verify inverse functions - Find the inverse of a function - Use the horizontal line test to determine if a function has an inverse function - Use the graph of a one-to-one function to graph its inverse function
December	**Unit 2 Part 1 : Polynomial Functions (Pre-Calc Unit 2)** - Graph and analyze quadratic functions using equations in both quadratic and standard forms. - Use the Leading Coefficient Test to determine the end behavior of graphs of polynomial functions. - Use the Fundamental Theorem of Algebra to determine the number of zeros of a polynomial function, as well as the number of critical points such as maxima, minima, points of inflection, and turning points. - Use graphing technology to identify the number of and approximate the real zeros of a polynomial function.- Use factoring methods, The Rational Zero Theorem, long division, synthetic division, and The Remainder and Factor Theorems to identify rational zeros of a polynomial function.

	- Use all of the above, in addition to the Quadratic Formula and operations with complex numbers, to determine all zeros of a polynomial function, (real and complex), and to sketch its graph.
January	**Unit 2 Part 2 : Rational Functions (Pre-Calc Unit 2)** - Determine horizontal, vertical, and slant asymptotes of rational functions, and use these to sketch the graphs, identify domains and ranges, and end behaviors. - Simplify rational expression - Solve rational equations - Decompose a rational expression into partial fractions. **Unit 3: Exponential and Logarithmic Functions (Pre-Calc Unit 3)** - Use the properties of exponents to evaluate and simplify expressions containing rational and irrational exponents, and those that contain the natural base e. - Graph exponential functions and inequalities - Graph exponential functions and inequalities, including those that involve growth, decay, and the natural base e.
February	**Unit 3: Exponential and Logarithmic Functions (Cont)** - Evaluate and simplify logarithmic expressions. - Graph logarithmic functions. - Evaluate and graph natural logarithmic functions. - Use the properties of logarithms to evaluate, rewrite, expand, and condense logarithmic expressions. - Solve exponential and logarithmic equations. - Use exponential and logarithmic functions to model and solve real-life problems.
March	**Unit 4: Trigonometric Functions of Angles (Pre-Calc Units 4-5)** - Describe and measure angles using radian and degree measure. - Convert degree measure to radian measure and vice versa. - Draw angles in standard form - Find coterminal angles - Find reference angles - Find complements and supplements - Find the length of a circular arc - Evaluate trigonometric functions of any angle, given a point on its terminal side. - Evaluate trigonometric functions of any angle, with or without using a reference angle.

	- Identify trigonometric functions of any angle using the period of the function, (or by identifying and using coterminal angles.) - Use the Fundamental Trigonometric Identities to determine the values of all six trigonometric functions. - Identify trigonometric functions of special angles with or without the use of a unit circle.
April	**Unit 4: Trigonometric Functions of Angles (Cont)** - Identify and construct a unit circle and recognize its relationship to real numbers. - Use a calculator to approximately evaluate a trigonometric function of any angle. - Use the right triangle trigonometric ratios and inverse trigonometric functions and Pythagorean Theorem to solve right triangles. - Use the Law of Sines to solve oblique triangles. - Use the Law of Cosines to solve oblique triangles. - Use the Law of Sines and/or Heron's Area Formula to calculate the area of an oblique triangle.
May	**Unit 5: Graphs of Trigonometric Functions (Pre-Calc Units 4-5)** - Sketch the graphs, analyze, compare, and identify domains and ranges of the basic trigonometric functions: sine, cosine, tangent, cotangent, secant, and cosecant. - Find the amplitude and period of a trigonometric function and use these characteristics to sketch its graph. - Identify and sketch translations of trigonometric graphs, (vertical shifts and phase shifts). - - Evaluate, graph and identify the domains and ranges of inverse trigonometric functions. - -Write equations for inverse trigonometric functions. - - Evaluate compositions of trigonometric functions. - - Use trigonometric functions and their inverses to model and solve real-life problems.
June	**Unit 5: Graphs of Trigonometric Functions (Cont)** - Use the Fundamental Trigonometric Identities to evaluate trigonometric functions, simplify and/or rewrite trigonometric expressions. - Use the Fundamental Trigonometric Identities to verify other trigonometric identities. - Use the Sum and Difference Formulas (or identities) to evaluate exact values for trigonometric functions. - Use the Double and Half-Angle Formulas (or identities) to evaluate exact values for trigonometric functions.

	- Use standard algebraic techniques, in addition to the objectives above, to solve trigonometric equations.
	Final Review