Algebra II

Course Description: Algebra II covers topics at a pace and depth appropriate for the average college-bound student. Less emphasis is placed on proof, higher-order systems of equations, and logarithms. The structure of our number system is stressed, and problems are solved with rational, irrational, and complex solutions.

Learning Targets

Domain: Functions: Building Functions

M.F.BF.A1 Write a function that describes a relationship between two quantities.

- I can write a linear function for specific input and output points.
- I can write a quadratic function given the vertex and another point.
- I can write the equation for a polynomial function given the zeros.
- I can write a rational function given the transformations and appropriate exponent.
- I can write an exponential function given two points.
- I can write a rational function given a situation involving a proportional relationship or inverse proportional relationship.
- I can write a trigonometric function to model harmonic motion and right triangle relationships.

M.F.BF.B.3 Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) using transformations for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

- I can graph a linear function based on the transformations done to the base graph.
- I can graph a quadratic function based on transformations done to the base graph.
- I can graph a rational function based on transformations done to the base function.
- I can graph an exponential function using transformations done to the base function.

M.F.BF.B.4 Identify and create inverse functions, using tables, graphs, and symbolic methods to solve for the other variable.

- I can algebraically solve for the inverse of a rational function or polynomial function and determine if the inverse is a function or just a relation.

M.F.BF.B5 Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.

- I can solve exponential and logarithmic equations using their inverse function.

Domain: Functions: Interpreting Functions

M.F.IF.B.5 Relate the domain of a function to its graph and find an appropriate domain (discrete or continuous) in the context of the given problem.

- I can identify the appropriate domain and range for rational functions.

M.F.IF.C.7 Graph functions expressed symbolically and show key features of the graph using an efficient method.

- I can graph a linear function using the slope, x-intercept, and y-intercept.
- I can graph a trigonometric function based on the periodic shift, amplitude, constant, and which trigonometric function it is.
- I can use the vertex of a quadratic function to sketch a graph.
- I can graph a logarithmic function using the x-intercept and where any negatives might appear.
- I can graph a rational function using the horizontal asymptote, vertical asymptote, zeros, y-intercept, removable discontinuities, and behavior around the vertical asymptotes.

Domain: Functions: Linear, Quadratic, and Exponential Models

M.F.LE.A.4 For exponential models, express as a logarithm the solution to abcct = d where a, c, and d are numbers and the base b is 2,10, or e; evaluate the logarithm using technology.

- I can rewrite an exponential expression in logarithmic form and a logarithmic expression in exponential form.

M.F.LE.B.5 Interpret the parameters in a linear or exponential function in terms of a context.

- I can interpret the slope, y-intercept, and other points in context of the problem.

Domain: Functions:Trigonometric Functions

M.F.TF.A.1 Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.

- I can convert between degree and radian measures and use them to find arc length, area of a sector, and linear speed.

M.F.TF.A.2 Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.

- I can find coterminal angles based on the periodic nature of trigonometric functions.

M.F.TF.A.3 (+) Use special triangles to determine geometrically the values of sine, cosine, tangent for $\pi/3$, $\pi/4$ and $\pi/6$, and use the unit circle to express the values of sine, cosine, and tangent for $\pi–x$, $\pi+x$, and $2\pi–x$ in terms of their values for x, where x is any real number.

- I can use the specific right triangle ratios for trigonometric functions to find missing values.

M.F.TF.A.4 (+) Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.

- I can use the unit circle to find reference angles.

M.F.TF.B.5 Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.

- I can use trigonometric functions to model simple harmonic motion.

M.F.TF.B.6 (+) Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed.

- I can evaluate trigonometric inverse functions to obtain an angle measure.

M.F.TF.B.7 (+) Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.

- I can solve a trigonometric equation and obtain multiple solutions using reference angles.

Domain: Algebra: Arithmetic with Polynomials and Rational Expressions

M.A.APR.A.1 Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.

- I can perform all operations with polynomial expressions.

M.A.APR.B.2 Know and apply the Remainder Theorem: For a polynomial p(x) and a number a, the remainder on division by x – a is p(a), so p(a) = 0 if and only if (x – a) is a factor of p(x).

- I can write a polynomial in factored form given its zeros.

M.A.APR.B.3 Identify zeros of polynomials when suitable factorizations are available and use the zeros to construct a rough graph of the function defined by the polynomial.

- I can identify the zeros of a polynomial given its factored form and use them to sketch a graph.

M.A.APR.D.6 Rewrite simple rational expressions in different forms; write a(x)/b(x) in the form q(x) + r(x)/b(x), where a(x), b(x), q(x), and r(x) are polynomials with the degree of r(x) less than the degree of b(x), using inspection, long division, or, for the more complicated examples, a computer algebra system.

- I can perform long division of polynomials where there is or is not a remainder.

M.A.APR.D.7 (+) Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.

- I can perform operations on rational expressions.

Domain: Algebra: Reasoning with Equations and Inequalities

M.A.REI.A.2 Solve simple rational and radical equations in one variable and give examples showing how extraneous solutions may arise.

- I can solve radical equations and determine if solutions are valid.
- I can solve rational equations and determine if any solutions are not valid.

M.A.REI.C.7 Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.

- I can solve a system of linear equations in two variables both graphically and algebraically.

Domain: Numbers and Quantity: The Complex Number System

M.N.CN.A.1 Know there is a complex number i such that , and every complex number has the form a + bi with a and b real. Understand why complex numbers exist.

- I can simplify and rewrite complex numbers.

M.N.CN.A.2 (+) Use the relation and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.

- I can perform operations on complex numbers.

M.N.CN.C.7 Solve quadratic equations with real coefficients that have complex solutions. Recognize when the quadratic formula gives complex solutions and write them as a ± bi for real numbers a and b.

- I can solve quadratic equations with real or complex solutions in the appropriate form.

M.N.CN.C.8 (+) Extend polynomial identities to the complex numbers. For example, rewrite x2+ 4 as (x + 2i)(x - 2i).

- I can simplify complex numbers and expressions.

M.N.CN.C.9 (+) Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.

- I can solve a quadratic equation using factoring.

Domain: Numbers and Quantity: The Real Number System

M.N.RN.A.1 Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents.

- I can apply the exponent properties to rewrite expressions.

M.N.RN.A.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents.

- I can rewrite an expression as a radical or exponential form based on the exponent.