PRESCOTT UNIFIED SCHOOL DISTRICT
District Instructional Guide
Date Revised 6/2/2016

Grade Level: 9-12	Subject: Algebra 2	Time: 1st Semester/2nd Semester	Core Text: Math Vision Project

Time	Unit/Topic	Standards	Assessments
1st Semester	FUNCTIONS AND THEIR INVERSES	**A2.F-BF.A Build a function that models a relationship between two quantities.** **A2.F-BF.A.1** Write a function that describes a relationship between two quantities. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions. Include problem-solving opportunities utilizing real-world context. a. Determine an explicit expression, a recursive process, or steps for calculation from a context. b. Combine function types using arithmetic operations and function composition. **A2.F-BF.A.2** Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms. **A2.F-BF.B Build new functions from existing functions.** **A2.F-BF.B.4** Find inverse functions. a. Understand that an inverse function can be obtained by expressing the dependent variable of one function as the independent variable of another, recognizing that functions f and g are inverse functions if and only if f(x) = y and g(y) = x for all values of x in the domain of f and all values of y in the domain of g. b. Understand that if a function contains a point (a,b), then the graph of the inverse relation of the function contains the point (b,a). c. Interpret the meaning of and relationship between a function and its inverse utilizing real-world context. **A2.A-REI.A Understand solving equations as a process of reasoning and explain**	Formative/Summative Unit Assessments

		the reasoning. **A2.A-REI.A.1** Explain each step in solving an equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. Extend from quadratic equations to rational and radical equations.	
	LOGARITHMIC FUNCTIONS	**A2.F-LE.A Construct and compare linear, quadratic, and exponential models and solve problems.** **A2.F-LE.A.4** For exponential models, express as a logarithm the solution to abct = d where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithms that are not readily found by hand or observation using technology. **A2.F-IF.C Analyze functions using different representations.** **A2.F-IF.C.7** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions. **A2.F-IF.C.8** Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. b. Use the properties of exponents to interpret expressions for exponential functions and classify those functions as exponential growth or decay	Formative/Summative Unit Assessments

	NUMBERS AND OPERATIONS	**A1.A-APR.A Perform arithmetic operations on polynomials.** **A1.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. **A1.A-APR.B Understand the relationship between zeros and factors of polynomials.** **A1.A-APR.B.3 I**dentify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial. Focus on quadratic and cubic polynomials in which linear and quadratic factors are available. **A2.F-IF.C Analyze functions using different representations.** **A2.F-IF.C.7** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions. **A2.F-BF.A Build a function that models a relationship between two quantities.** **A2.F-BF.A.1** Write a function that describes a relationship between two quantities. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions. Include problem-solving opportunities utilizing real-world context. a. Determine an explicit expression, a recursive process, or steps for calculation from a context. b. Combine function types using arithmetic operations and function composition. **A2.A-REI.B Solve equations and inequalities in one variable.** **A2.A-REI.B.4** 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. Focus on quadratic and cubic polynomials in which linear and quadratic factors are available. **A2.N-CN.A Perform arithmetic operations with complex numbers.** **A2.N-CN.A.1** Apply the relation i 2 = –1 and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers. Write complex numbers in the	Formative/Summative Unit Assessments

		form (a+bi) with a and b real. **A2.N-CN.C Use complex numbers in polynomial identities and equations.** **A2.N-CN.C.7** Solve quadratic equations with real coefficients that have complex solutions.	
	POLYNOMIAL FUNCTIONS	**A2.F-BF.A Build a function that models a relationship between two quantities.** **A2.F-BF.A.1** Write a function that describes a relationship between two quantities. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions. Include problem-solving opportunities utilizing real-world context. a. Determine an explicit expression, a recursive process, or steps for calculation from a context. b. Combine function types using arithmetic operations and function composition. **A2.F-LE.A Construct and compare linear, quadratic, and exponential models and solve problems**. **A2.F-LE.A.4** For exponential models, express as a logarithm the solution to abct = d where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithms that are not readily found by hand or observation using technology. **A2.A-CED.A Create equations that describe numbers or relationships.** **A2.A-CED.A.1** Create equations and inequalities in one variable and use them to solve problems. Include problem-solving opportunities utilizing real-world context. Focus on equations and inequalities arising from linear, quadratic, rational, and exponential functions. **A2.F-IF.B Interpret functions that arise in applications in terms of the context.** **A2.F-IF.B.4** For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Include problem-solving opportunities utilizing a real-world context. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. Functions include linear, quadratic,	Formative/Summative Unit Assessments

		exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions. **A2.F-IF.C Analyze functions using different representations.** **A2.F-IF.C.7** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions. **A2.A-APR.B Understand the relationship between zeros and factors of polynomials.** **A2.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. Focus on quadratic, cubic, and quartic polynomials including polynomials for which factors are not provided. **A2.A-SSE.A Interpret the structure of expressions.** **A2.A-SSE.A.2** Use structure to identify ways to rewrite polynomial and rational expressions. Focus on polynomial operations and factoring patterns.	
	RATIONAL EXPRESSIONS AND FUNCTIONS	**A2.F-IF.B Interpret functions that arise in applications in terms of the context.** **A2.F-IF.B.4** For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Include problem-solving opportunities utilizing a real-world context. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions. **A2.F-IF.C Analyze functions using different representations.** **A2.F-IF.C.7** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions.	Formative/Summative Unit Assessments

		A2.A-CED.A Create equations that describe numbers or relationships. **A2.A-CED.A.1** Create equations and inequalities in one variable and use them to solve problems. Include problem-solving opportunities utilizing real-world context. Focus on equations and inequalities arising from linear, quadratic, rational, and exponential functions. **A2.A-APR.D Rewrite rational expressions.** **A2.A-APR.D.6** Rewrite 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. **A2.A-SSE.B Write expressions in equivalent forms to solve problems.** **A2.A-SSE.B.3** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. Include problem-solving opportunities utilizing real-world context and focus on expressions with rational exponents. c. Use the properties of exponents to transform expressions for exponential functions. **A2.N-RN.A Extend the properties of exponents to rational exponents.** **A2.N-RN.A.2** Rewrite expressions involving radicals and rational exponents using the properties of exponents. **A2.A-REI.A.2** Solve rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.	
2nd Semester	MODELING PERIODIC BEHAVIOR	**A2.F-TF.A Extend the domain of trigonometric functions using the unit circle.** **A2.F-TF.A.2 E**xplain how the unit circle in the coordinate plane enables the extension of sine and cosine functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle. **A2.F-TF.B Model periodic phenomena with trigonometric functions.** **A2.F-TF.B.5** Create and interpret sine, cosine and tangent functions that model periodic phenomena with specified amplitude, frequency, and midline.	Formative/Summative Unit Assessments

		A2.F-BF.B Build new functions from existing functions. **A2.F-BF.B.3** Identify the effect on the graph of replacing f(x) by f(x) + k, kf(x), f(kx), and f(x+k) 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. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions. **A2.F-IF.B Interpret functions that arise in applications in terms of the context.** **A2.F-IF.B.4** For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Include problem-solving opportunities utilizing a real-world context. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions.	
	TRIGONOMETRIC FUNCTIONS, EQUATIONS & IDENTITIES	**A2.F-TF.A Extend the domain of trigonometric functions using the unit circle.** **A2.F-TF.A.1** Understand radian measure of an angle as the length of the arc on any circle subtended by the angle, measured in units of the circle's radius. **A2.F-TF.A.2** Explain how the unit circle in the coordinate plane enables the extension of sine and cosine functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle. **A2.F-TF.B Model periodic phenomena with trigonometric functions.** **A2.F-TF.B.5** Create and interpret sine, cosine and tangent functions that model periodic phenomena with specified amplitude, frequency, and midline. **A2.F-TF.C Apply trigonometric identities.**	Formative/Summative Unit Assessments

		A2.F-TF.C.8 Use the Pythagorean identity sin2 (θ) + cos2 (θ) = 1 and the quadrant of the angle θ to find sin(θ), cos(θ), or tan(θ) given sin(θ) or cos(θ). **A1.F-IF.B Interpret functions that arise in applications in terms of the context.** **A1.F-IF.B.5** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.	
	MODELING WITH FUNCTIONS	**A2.F-BF.A Build a function that models a relationship between two quantities.** **A2.F-BF.A.1** Write a function that describes a relationship between two quantities. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions. Include problem-solving opportunities utilizing real-world context. a. Determine an explicit expression, a recursive process, or steps for calculation from a context. b. Combine function types using arithmetic operations and function composition. **A2.F-BF.B Build new functions from existing functions.** **A2.F-BF.B.3** Identify the effect on the graph of replacing f(x) by f(x) + k, kf(x), f(kx), and f(x+k) 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. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions. **A2.F-BF.B.4** Find inverse functions. a. Understand that an inverse function can be obtained by expressing the dependent variable of one function as the independent variable of another, recognizing that functions f and g are inverse functions if and only if f(x) = y and g(y) = x for all values of x in the domain of f and all values of y in the domain of g. b. Understand that if a function contains a point (a,b), then the graph of the inverse relation of the function contains the point (b,a). c. Interpret the meaning of and relationship between a function and its inverse utilizing real-world context.	Formative/Summative Unit Assessments

	STATISTICS	**A2.S-IC.A Understand and evaluate random processes underlying statistical experiments.** **A2.S-IC.A.1** Understand statistics as a process for making inferences about population parameters based on a random sample from that population. **A2.S-IC.A.2** Explain whether a specified model is consistent with results from a given data-generating process. **A2.S-ID.A Summarize, represent, and interpret data on a single count or measurement variable.** **A2.S-ID.A.4** Use the mean and standard deviation of a data set to fit it to a normal curve, and use properties of the normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, or tables to estimate areas under the normal curve. **S.CP.6.** Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in terms of the model. **S.CP.1.** Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or", "and", "not"). **S.CP.2.** Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent. **S.CP.3.** Understand the conditional probability of A given B as P(A and B)/P(B), and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B. **S.CP.4.** Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. **S.CP.5.** Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. *For example, compare the change of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.* **S.CP.7.** Apply the Addition Rule and interpret the answer in terms of the model.	Formative/Summative Unit Assessments

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Mathematical Practices (MP)
1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.