PRESCOTT UNIFIED SCHOOL DISTRICT
District Instructional Guide
Date Revised

Grade Level: 11-12	Subject: Algebra 5	Time: 1st Semester	Core Text: McDougal Littell: Algebra 2 (2008)

Time	Unit/Topic	Standards	Assessments
1st Semester	Linear Functions, Equations and Inequalities	**HS.A-SSE.A.2.** Use the structure of an expression to identify ways to rewrite it. *For example, see $x^4 – y^4$ as $(x^2)^2 – (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 – y^2)(x^2 + y^2)$.* **HS.A-CED.A.1.** Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.* **HS.A-REI.C.6.** Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. Connection: *ETHS-S6C2-03* **HS.F-IF.A.3.** Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. *For example, the Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1) for $n \geq 1$.* **HS.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. a. Graph linear and quadratic functions and show intercepts, maxima, and minima. Connections: *ETHS-S6C1-03*; *ETHS-S6C2-03* b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. Connections: *ETHS-S6C1-03*; *ETHS-S6C2-03*	Formative/Summative Unit Assessments

		HS.F-IF.C.9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.* *Connections: ETHS-S6C1-03; ETHS-S6C2-03; 9-10.RST.7*	
	Linear Systems and Matrices	**HS.N-VM.C.6.** Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network. *Connections: 9-10.RST.7; 9-10.WHST.2f; 11-12.RST.9; 11-12.WHST.2e; ETHS-S6C2-03* **HS.N-VM.C.7.** Multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled. *Connections: 9-10.RST.3; ETHS-S6C2-03* **HS.N-VM.C.8.** Add, subtract, and multiply matrices of appropriate dimensions. *Connections: 9-10.RST.3; ETHS-S6C2-03* **HS.A-REI.C.8.** Represent a system of linear equations as a single matrix equation in a vector variable. **HS.A-REI.C.9.** Find the inverse of a matrix if it exists, and use it to solve systems of linear equations (using technology for matrices of dimension 3 x3 or greater). *Connection: ETHS-S6C2-03*	Formative/Summative Unit Assessments
	Quadratic Functions and Equations	**HS.A-SSE.A.2.** Use the structure of an expression to identify ways to rewrite it. *For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$.* **HS.N-CN.A.1.** Know there is a complex number i such that $i^2 = -1$, and every	Formative/Summative Unit Assessments

		complex number has the form $a + bi$ with a and b real. **HS.N-CN.A.2.** Use the relation $i^2 = –1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers. Connection: *11-12.RST.4* **HS.N-CN.C.7.** Solve quadratic equations with real coefficients that have complex solutions. **HS.A-CED.A.1.** Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.* **HS.A-REI.B.4.** Solve quadratic equations in one variable. b.Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b. Connections: *ETHS-S6C2.03*; *9-10.RST.7*; *11-12.RST.7* **HS.A-REI.C.7.** Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. *For example, find the points of intersection between the line $y = –3x$ and the circle $x^2 + y^2 = 3$.* **HS.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. a. Graph linear and quadratic functions and show intercepts, maxima, and minima. Connections: *ETHS-S6C1-03*; *ETHS-S6C2-03* **HS.F-IF.C.9.** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.* *Connections: ETHS-S6C1-03; ETHS-S6C2-03; 9-10.RST.7*	

		HS.F-BF.A.1. Write a function that describes a relationship between two quantities. Connections: *ETHS-S6C1-03*; *ETHS-S6C2-03* a. Determine an explicit expression, a recursive process, or steps for calculation from a context. Connections: *ETHS-S6C1-03*; *ETHS-S6C2-03*; *9-10.RST.7*; *11-12.RST.7* b. Combine standard function types using arithmetic operations. *For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.* *Connections: ETHS-S6C1-03; ETHS-S6C2-03*	
	Polynomial and Rational Functions and Equations	**HS.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 $p(x)$. **HS.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. **HS.A-APR.C.4.** Prove polynomial identities and use them to describe numerical relationships. *For example, the polynomial identity* $(x^2+y^2)^2 = (x^2– y^2)^2 + (2xy)^2$ *can be used to generate Pythagorean triples.* **HS.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. **HS.A-CED.A.1.** Create equations and inequalities in one variable and use them to	Formative/Summative Unit Assessments

		solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.* **HS.A-REI.A.1.** Explain each step in solving a simple 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. **HS.A-REI.A.2.** Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. **HS.A-REI.D.11.** Explain why the *x*-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions. Connection: *ETHS-S6C2-03* **HS.F-IF.B.6.** Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. Connections: *ETHS-S1C2-01*; *9-10.RST.3* **HS.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. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. Connections: *ETHS-S6C1-03*; *ETHS-S6C2-03* c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. Connections: *ETHS-S6C1-03*; *ETHS-S6C2-03*	

	Exponential and Logarithmic Functions and Equations	**HS.N-RN.A.1.** Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. *For example, we define $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3 = 5^{(1/3)3}$ to hold, so $(5^{1/3})^3$ must equal 5.* *Connections: 11-12.RST.4; 11-12.RST.9; 11-12.WHST.2d* **HS.N-RN.A.2.** Rewrite expressions involving radicals and rational exponents using the properties of exponents. **HS.N-Q.A.2.** Define appropriate quantities for the purpose of descriptive modeling. **HS.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. Connection: *11-12.RST.4* c. Use the properties of exponents to transform expressions for exponential functions*. For example the expression 1.15^t can be rewritten as $(1.15^{1/12})^{12t} \approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.* **HS.A-CED.A.1.** Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.* **HS.F-IF.B.6.** Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. Connections: *ETHS-S1C2-01*; *9-10.RST.3* **HS.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. e. Graph exponential and logarithmic functions, showing intercepts and end	Formative/Summative Unit Assessments

		behavior, and trigonometric functions, showing period, midline, and amplitude. Connections: *ETHS-S6C1-03*; *ETHS-S6C2-03* **HS.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. Connection: *11-12.RST.7* b. Use the properties of exponents to interpret expressions for exponential functions. *For example, identify percent rate of change in functions such as* $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)^{12t}$, $y = (1.2)^{t/10}$, *and classify them as representing exponential growth or decay.* *Connection: 11-12.RST.7* **HS.F-BF.B.4** Find inverse functions. Connection: *ETHS-S6C2-03* a. Solve an equation of the form $f(x) = c$ for a simple function f that has an inverse and write an expression for the inverse. *For example,* $f(x) = 2x^3$ *or* $f(x) = (x+1)/(x-1)$ *for* $x \neq 1$. **HS.F-LE.A.4.** For exponential models, express as a logarithm the solution to $ab^{ct} = d$ where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology. Connections: *ETHS-S6C1-03*; *ETHS-S6C2-03*; *11-12.RST.3* **HS.F-LE.B.5.** Interpret the parameters in a linear or exponential function in terms of a context. Connections: *ETHS-S6C1-03*;*ETHS-S6C2-03*;*11-12.WHST.2e*	
	Modeling Functions	**HS.N-Q.A.2.** Define appropriate quantities for the purpose of descriptive modeling. **HS.F-IF.A.3.** Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. *For example, the Fibonacci sequence is defined recursively by* $f(0) = f(1) = 1$, $f(n+1) = f(n) + f(n-1)$ *for* $n \geq 1$.	Formative/Summative Unit Assessments

		HS.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. c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. Connections: *ETHS-S6C1-03*; *ETHS-S6C2-03* e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. Connections: *ETHS-S6C1-03*; *ETHS-S6C2-03* **HS.F-BF.B.3.** Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k\,f(x)$, $f(kx)$, and $f(x + k)$ 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.* *Connections: ETHS-S6C2-03; 11-12.WHST.2e*	

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.

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