## 2022 - 2023, HS, Algebra II

***The following Practice Standards and Literacy Skills will be used throughout the course:***

| ***Standards for Mathematical Practice*** | ***Literacy Skills for Mathematical Proficiency*** |
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| *1. Make sense of problems and persevere in solving them.* | *1. Use multiple reading strategies.* |
| *2. Reason abstractly and quantitatively.* | *2. Understand and use correct mathematical vocabulary.* |
| *3. Construct viable arguments and critique the reasoning of others.* | *3. Discuss and articulate mathematical ideas.* |
| *4. Model with mathematics. ★* | *4. Write mathematical arguments.* |
| *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.* | |

## Quarter 1

| Standards | Evidence of Learning Statements from Instructional Focus Document |
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| **A2.F.IF.A.1** 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. ★<br><br>*Scope and Clarifications:*<br>*Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; and end behavior.*<br><br>*i. Tasks have a real-world context.*<br><br>*ii. Tasks may involve square root, cube root, polynomial, exponential, and logarithmic functions.* | Identify all evident key features when provided a table of values representing a square root, cube root, polynomial, exponential, or logarithmic function.<br><br>Identify key features of the graph or table and interpret the meaning of the key features in relationship to the context of the problem, given a graph or table of values representing a square root function embedded in a real-world context.<br><br>Identify key features of the graph or table and interpret the meaning of the key features in relationship to the context of the problem, given a graph or table of values representing a cube root function embedded in a real-world context.<br><br>Identify key features of the graph or table and interpret the meaning of the key features in relationship to the context of the problem, given a graph or table of values representing an exponential function embedded in a real-world context.<br><br>Identify key features of the graph or table and interpret the meaning of the key features in relationship to the context of the problem, given a graph or table of values representing a polynomial function embedded in |

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| | a real-world context.<br><br>Identify key features of the graph or table and interpret the meaning of the key features in relationship to the context of the problem, given a graph or table of values representing a logarithmic function embedded in a real-world context.<br><br>Sketch a graph of the function, given a verbal description of the key features of a square root, cube root, polynomial, exponential, or logarithmic function. |
| **A2.F.IF.A.2** 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.★<br><br>*Scope and Clarifications:*<br>*i) Tasks have a real-world context.*<br><br>ii) Tasks may involve polynomial, exponential, and logarithmic functions. | Calculate average rate of change when given an equation or table of a polynomial, exponential, or logarithmic functions.<br><br>Interpret the average rate of change of a polynomial, exponential, or logarithmic function.<br><br>Estimate the average rate of change for a specific interval of a polynomial, exponential, or logarithmic function when given a graph. |
| **A2.F.IF.B.3** Graph functions expressed symbolically and show key features of the graph, by hand and using technology.<br><br>**a.** Graph square root, cube root, and piecewise defined functions, including step functions and absolute value functions.<br><br>*Scope and Clarifications:*<br>*A2.F.IF.B.3a: Tasks are limited to square root and cube root functions. The other functions are assessed in Algebra 1.* | Graph a square root, cube root, polynomial with degree greater than two, exponential, ~~and logarithmic~~ function by hand and using technology.<br><br>Describe end behavior of a polynomial function with degree greater than two given in standard form and factored form.<br><br>Attend to precision when illustrating intercepts, maxima, minima, and determine the domain, range, and end behavior of a function. |
| **A2.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. ★<br><br>*Scope and Clarifications:*<br>*i) Tasks may involve polynomial, exponential, and logarithmic functions.* | Describe the effect on the graph for specific values of k, given two functions, $f(x)$ and$f(x)+k$.<br><br>Describe the effect on the graph for specific values of k, given two functions, $f(x)$ and $kf(x)$.<br><br>Describe the effect on the graph for specific values of k, given two functions, $f(x)$ and $f(x+k)$ |

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| ii) Tasks may involve recognizing even and odd functions. | Describe the effect on the graph for specific values of k, given two functions, $f(x)$ and $f(kx)$.<br><br>Determine if the function is an odd function, even function, or neither, given a function defined by an expression.<br><br>Describe multiple effects on a graph for specific values of $a$, $b$, $h$, and $k$ given two functions, $f(x)$ and $af\big(b(x+h)\big)+k$.<br><br>Find the value of k for a specific vertical or horizontal translation, stretch, or compression, given two graphs, the image and pre-image. |
| **A2.F.BF.B.4** Find inverse functions.<br><br>**a.** Find the inverse of a function when the given function is one-to-one. | Find the inverse of a function when the given function is one-to-one.<br><br>Graph the inverse of a given linear function.<br><br>Graph the inverse of a given cubic function.<br><br>Graph the inverse of a quadratic function with a restricted domain.<br><br>Find the inverse of a quadratic function by first restricting the domain to make it one-to-one. |
| **A2.F.IF.B.3** Graph functions expressed symbolically and show key features of the graph, by hand and using technology.<br><br>**a.** Graph square root, cube root, and piecewise defined functions, including step functions and absolute value functions.<br><br>*Scope and Clarifications:*<br>*A2.F.IF.B.3a: Tasks are limited to square root and cube root functions. The other functions are assessed in Algebra 1.* | Graph a square root, cube root, polynomial with degree greater than two, exponential, and logarithmic function by hand and using technology.<br><br>Describe end behavior of a polynomial function with degree greater than two given in standard form and factored form.<br><br>Attend to precision when illustrating intercepts, maxima, minima, and determine the domain, range, and end behavior of a function. |

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| **A2.A.CED.A.1** Create equations and inequalities in one variable and use them to solve problems.<br><br>*Scope and Clarifications:*<br>*Include equations arising from linear and quadratic functions, and rational and exponential functions.* | Create and solve a one variable linear, quadratic, rational, or exponential equation that represents a real-world situation.<br><br>Create and solve a one-variable linear, quadratic, rational, or exponential inequality that represents a real-world situation. |
| **A2.A.REI.D.6** 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 approximate solutions using technology. ★<br><br>*Scope and Clarifications*:<br>*Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions. Tasks may involve any of the function types mentioned in the standard.* | Approximate the solution(s) for f(x) = g(x) using technology when f(x) and g(x) are non-linear, non-quadratic polynomial; rational; exponential; or logarithmic functions, given two equations f(x) and g(x) embedded in a real-world situation.<br><br>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). |
| **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.<br><br>*Scope and Clarifications:*<br>*Tasks are limited to square root, cube root, polynomial, rational, and logarithmic functions.* | Solve square root, cube root, polynomial, rational, and logarithmic equations using multiple solution strategies and explain each step in the solution method.<br><br>Construct a viable argument to justify a chosen solution method used to solve a square root, cube root, polynomial, rational, and logarithmic equation.<br><br>Compare the steps in each and determine which solution method is most efficient, given an equation with multiple solution methods.<br><br>Explain why an equation has no solution or infinitely many solutions. |
| **A2.N.CN.A.1** Know there is a complex number *i* such that $i^2 = -1$, and every complex number has the form *a + bi* with *a* and *b* real. | State that there is a complex number $i$ such that $i^2 = -1$.<br><br>Distinguish between a real number, a pure imaginary number and a complex number.<br><br>Express complex numbers in the written form $a + bi$, where $a$ and $b$ represent real numbers. |
| **A2.N.CN.A.2** Know and use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex | Add, subtract, and multiply complex numbers. |

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| numbers. | Explain when the commutative, associative, and distributive properties are helpful when writing equivalent expressions involving complex numbers.<br><br>Recognize there is a pattern that will emerge when $i$ is raised to positive integer powers. |
| **A2.N.CN.B.3** Solve quadratic equations with real coefficients that have complex solutions. | Solve using the quadratic formula and identify solutions as real or complex, given a quadratic equation in the form $ax^2 + bx + c = 0$.<br><br>Solve by completing the square and identify solutions as real or complex, given a quadratic equation in the form $ax^2 + bx + c = 0$.<br><br>Explain why quadratic functions may produce real or complex solutions.<br><br>Determine the reasonableness of solutions by graphing a quadratic function and examining the roots. |
| **A2.A.REI.B.3** Solve quadratic equations and inequalities in one variable.<br><br>**a.** Solve quadratic equations by inspection (e.g., for $x^2$=49), taking square roots, completing the square, knowing, and applying 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±bi* for real numbers *a* and *b*.<br><br>*Scope and Clarifications:*<br>*In the case of equations that have roots with nonzero imaginary parts, students write the solutions as a ± bi for real numbers a and b.* | Solve quadratic equations in one variable that generate complex solutions using multiple strategies and express the solutions in the form a ± bi for real numbers a and b.<br><br>Solve a complex quadratic inequality in one variable. |
| **A2.A.REI.C.4** Write and solve a system of linear equations in context.<br><br>*Scope and Clarifications:*<br>*When solving algebraically, tasks are limited to systems of at most three equations and three variables. With graphic solutions systems are limited to only two variables.* | Write a system of equations in two variables, From a real-world situation.<br><br>Interpret the solution of a system of equations in two variables in context.<br><br>Solve a system of equations in three variables algebraically.<br><br>Justify why a system of three linear equations may have one solution, no |

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| | solutions, or infinitely many solutions.<br>Use technology to solve a system of three linear equations.<br><br>Write a system of equations in three variables, from a real-world situation.<br><br>Interpret the solution to a system of equations in three variables in context. |
| **A2.A.REI.C.5** Solve a system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. | Solve a system of a linear equation and a quadratic equation graphically using technology.<br><br>Solve a system of a linear equation and a quadratic equation algebraically using substitution.<br><br>Justify why a system consisting of a linear equation and a quadratic equation may have no solution, one solution, or two solutions. |
| **ACT Preparation: (These can be taught at any time but seem appropriate here.)**<br>Multiply matrices by scalars to produce new matrices, e.g., as when all the payoffs in a game are doubled.<br>Add, subtract, and multiply matrices of appropriate dimensions.<br><br>Calculate determinants using technology.<br><br>Use matrices to solve systems of linear equations with technology for matrices of dimension $2 \times 2$ and $3 \times 3$. | Determine if matrices may be added, subtracted, or multiplied by using their dimensions.<br>Add, subtract, and multiply matrices of appropriate dimensions.<br><br>Use technology to calculate the determinant of a matrix.<br><br>Use technology when solving system of equations represented by matrices of dimensions $2 \times 2$ and $3 \times 3$. |
| **A2.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.<br><br>*Scope and Clarifications:*<br>*i) Tasks may involve polynomial, exponential, and logarithmic functions.*<br><br>*ii) Tasks may involve recognizing even and odd functions.* | Describe the effect on the graph for specific values of k, given two functions, $f(x)$ and $f(x) + k$.<br><br>Describe the effect on the graph for specific values of k, given two functions, $f(x)$ and $kf(x)$.<br><br>Describe the effect on the graph for specific values of k, given two functions, $f(x)$ and $f(x + k)$ |

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| | Describe the effect on the graph for specific values of k, given two functions, $f(x)$ and $f(kx)$.<br><br>Determine if the function is an odd function, even function, or neither, given a function defined by an expression.<br><br>Describe multiple effects on a graph for specific values of $a$, $b$, $h$, and $k$ given two functions, $f(x)$ and $af\big(b(x+h)\big)+k$.<br><br>Find the value of k for a specific vertical or horizontal translation, stretch, or compression, given two graphs, the image and pre-image. |
| **A2.F.IF.B.3** Graph functions expressed symbolically and show key features of the graph, by hand and using technology. ★<br><br>**b.** Graph polynomial functions, identifying zeros when suitable factorizations are available and showing end behavior. | Graph a square root, cube root, polynomial with degree greater than two, exponential, and logarithmic function by hand and using technology.<br><br>Describe end behavior of a polynomial function with degree greater than two given in standard form and factored form.<br><br>Attend to precision when illustrating intercepts, maxima, minima, and determine the domain, range, and end behavior of a function. |
| **A2.A.APR.A.2** 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.<br><br>*Scope and Clarifications:*<br>*Tasks include quadratic, cubic, and quartic polynomials and polynomials for which factors are not provided. For example, find the zeros of* $(x^2-1)(x^2+1)$. | Factor a quadratic, cubic, or quartic polynomial, identify the zeroes, and construct a rough graph of the function defined by the polynomial.<br><br>Generate a rough graph to represent a given non-quadratic polynomial function presented in factored form. |
| **A2.F.IF.A.1** 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. ★<br><br>*Scope and Clarifications:*<br>*Key features include intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums;* | Identify all evident key features when provided a table of values representing a square root, cube root, polynomial, exponential, or logarithmic function.<br><br>Identify key features of the graph or table and interpret the meaning of the key features in relationship to the context of the problem, given a graph or table of values representing a square root function embedded in a real-world context. |

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| *symmetries; and end behavior.*<br><br>*i. Tasks have a real-world context.*<br><br>*ii. Tasks may involve square root, cube root, polynomial, exponential, and logarithmic functions.* | Identify key features of the graph or table and interpret the meaning of the key features in relationship to the context of the problem, given a graph or table of values representing a cube root function embedded in a real-world context.<br><br>Identify key features of the graph or table and interpret the meaning of the key features in relationship to the context of the problem, given a graph or table of values representing an exponential function embedded in a real-world context.<br><br>Identify key features of the graph or table and interpret the meaning of the key features in relationship to the context of the problem, given a graph or table of values representing a polynomial function embedded in a real-world context.<br><br>Identify key features of the graph or table and interpret the meaning of the key features in relationship to the context of the problem, given a graph or table of values representing a logarithmic function embedded in a real-world context.<br><br>Sketch a graph of the function, given a verbal description of the key features of a square root, cube root, polynomial, exponential, or logarithmic function. |
| **Honors Addendum:**<br>A2.WCE.1<br>Know and apply the Binomial Theorem for the expansion of $(x + y)^n$ in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined for example by Pascal's Triangle. | Expand a binomial using Pascal's Triangle/combinations.<br><br>Use the Binomial Theorem to determine the probability of a binomial experiment. |

## Quarter 2

| Standards | Evidence of Learning Statements from Instructional Focus Document |
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| **A2.F.BF.A.1** Write a function that describes a relationship between two quantities.<br><br>**a.** Determine an explicit expression, a recursive process, or steps for calculation from a context.<br><br>**b.** Combine standard function types using arithmetic operations.<br><br>*Scope and Clarifications:*<br>*For example, given cost and revenue functions, create a profit function.*<br>*For A2.F.BF.A.1a:*<br>*i) Tasks have a real-world context.*<br><br>*ii) Tasks may involve linear functions, quadratic function*s, and exponential functions. | Write a function defined by an expression to model a quadratic relationship, given a real-world context.<br><br>Write a function defined by an expression to model an exponential relationship, given a real-world context.<br><br>Compare key characteristics of real-world contexts that can be described by various types of functions.<br><br>Combine multiple functions using arithmetic operations to write a function that describes a real-world situation with multiple steps. For example, combine a linear function and an exponential function. |
| **A2.A.APR.B.3** Know and use polynomial identities to describe numerical relationships.<br><br>*Scope and Clarifications:*<br>*For example, compare* $(31)(29) = (30 + 1)(30 - 1) = 30^2 - 1^2$ *with* $(x + y)(x - y) = x^2 - y^2$. | Identify an appropriate polynomial identity and use it to describe a given numerical relationship. |
| **A2.A.SSE.A.1** Use the structure of an expression to identify ways to rewrite it.<br><br>*Scope and Clarifications:*<br>*For example, see* $2x^4 + 3x^2 - 5$ *as its factors* $(x^2 - 1)$ *and* $(2x^2 + 5)$*; see* $(x^2 + 4)$ *as* $(x^2)^2 - (y^2)^2$*, thus recognizing it as a difference of squares that can be factored as* $(x^2 - y^2)(x^2 + y^2)$*; see* $(x^2 + 4)/(x^2 + 3)$*as* $\big((x^2 + 3) + 1\big)/(x^2 + 3)$*, thus recognizing an opportunity to write it as* $1 + 1/(x^2 + 3)$*. Tasks are limited to polynomial, rational, or exponential expressions*. | Rewrite polynomial, rational, and exponential expressions into a different form and explain why rewriting the expression in that form is beneficial. |

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| **A2.A.APR.C.4** Rewrite rational expressions in different forms. | Rewrite rational expressions involving addition, subtraction, multiplication and/or division in different forms |
| **A2.A.APR.A.1** 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)*. | For a polynomial p(x) and a number a, determine if x-a is a factor of p(x).<br><br>Identify the remainder when a polynomial p(x) is divided by x - a.<br><br>Identify all possible factors of a polynomial p(x). |
| **A2.A.APR.A.2** 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.<br><br>*Scope and Clarifications:*<br>*Tasks include quadratic, cubic, and quartic polynomials and polynomials for which factors are not provided. For example, find the zeros of* $(x^2 - 1)(x^2 + 1)$. | Factor a quadratic, cubic, or quartic polynomial, identify the zeroes, and construct a rough graph of the function defined by the polynomial.<br><br>Generate a rough graph to represent a given non-quadratic polynomial function presented in factored form. |
| **A2.A.CED.A.1** Create equations and inequalities in one variable and use them to solve problems.<br><br>*Scope and Clarifications:*<br>*Include equations arising from linear and quadratic functions, and rational and exponential functions.* | Create and solve a one variable linear, quadratic, rational, or exponential equation that represents a real-world situation.<br><br>Create and solve a one-variable linear, quadratic, rational, or exponential inequality that represents a real-world situation. |
| **A2.A.CED.A.2** Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.<br><br>*Scope and Clarifications:*<br>*i. Tasks are limited to square root, cube root, polynomial, rational, and logarithmic functions.*<br><br>*ii. Tasks have a real-world context.* | Rearrange real-world square root formulas to highlight a quantity of interest.<br><br>Rearrange real-world cube root formulas to highlight a quantity of interest.<br><br>Rearrange real-world non-quadratic polynomial formulas to highlight a quantity of interest.<br><br>Rearrange real-world rational formulas to highlight a quantity of interest.<br><br>Rearrange real-world logarithmic formulas to highlight a quantity of interest. |

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| **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.<br><br>*Scope and Clarifications:*<br>*Tasks are limited to square root, cube root, polynomial, rational, and logarithmic functions.* | Solve square root, cube root, polynomial, rational, and logarithmic equations using multiple solution strategies and explain each step in the solution method.<br><br>Construct a viable argument to justify a chosen solution method used to solve a square root, cube root, polynomial, rational, and logarithmic equation.<br><br>Compare the steps in each and determine which solution method is most efficient, given an equation with multiple solution methods.<br><br>Explain why an equation has no solution or infinitely many solutions. |
| **A2.A.REI.A.2** Solve rational and radical equations in one variable and identify extraneous solutions when they exist. | Solve rational equations in one variable.<br><br>~~Solve radical equations in one variable.~~<br><br>Identify extraneous solutions algebraically<br><br>Justify solutions graphically using technology. |
| **A2.F.BF.B.4** Find inverse functions.<br><br>**a.** Find the inverse of a function when the given function is one-to-one. | Find the inverse of a function when the given function is one-to-one.<br><br>Graph the inverse of a given linear function.<br><br>Graph the inverse of a given cubic function.<br><br>Graph the inverse of a quadratic function with a restricted domain.<br><br>Find the inverse of a quadratic function by first restricting the domain to make it one-to-one. |
| **A2.F.IF.B.3** ★ Graph functions expressed symbolically and show key features of the graph, by hand and using technology.<br><br>**a.** Graph square root, cube root, and piecewise defined functions and absolute value functions.<br><br>*Scope and Clarifications:* | Graph a square root, cube root, polynomial with degree greater than two, exponential, and logarithmic function by hand and using technology.<br><br>Describe end behavior of a polynomial function with degree greater than two given in standard form and factored form.<br><br>Attend to precision when illustrating intercepts, maxima, minima, and |

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| *A2.F.IF.B.3a: Tasks are limited to square root and cube root functions. The other functions are assessed in Algebra 1.* | determine the domain, range, and end behavior of a function. |
| **A2.F.IF.A.1** 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. ★<br><br>*Scope and Clarifications:*<br>*Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; and end behavior.*<br><br>*i. Tasks have a real-world context.*<br><br>*ii. Tasks may involve square root, cube root, polynomial, exponential, and logarithmic functions.* | Identify all evident key features when provided a table of values representing a square root, cube root, polynomial, exponential, or logarithmic function.<br><br>Identify key features of the graph or table and interpret the meaning of the key features in relationship to the context of the problem, given a graph or table of values representing a square root function embedded in a real-world context.<br><br>Identify key features of the graph or table and interpret the meaning of the key features in relationship to the context of the problem, given a graph or table of values representing a cube root function embedded in a real-world context.<br><br>Identify key features of the graph or table and interpret the meaning of the key features in relationship to the context of the problem, given a graph or table of values representing an exponential function embedded in a real-world context.<br><br>Identify key features of the graph or table and interpret the meaning of the key features in relationship to the context of the problem, given a graph or table of values representing a polynomial function embedded in a real-world context.<br><br>Identify key features of the graph or table and interpret the meaning of the key features in relationship to the context of the problem, given a graph or table of values representing a logarithmic function embedded in a real-world context.<br><br>Sketch a graph of the function, given a verbal description of the key features of a square root, cube root, polynomial, exponential, or logarithmic function. |

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| **A2.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.<br><br>*Scope and Clarifications:*<br>*For example, we define* $5^{\frac{1}{3}}$ *to be the cube root of 5 because we want* $\left(5^{\frac{1}{3}}\right)^3 = 5\left(\frac{1}{3}\right)^3$ *to hold, so* $\left(5^{\frac{1}{3}}\right)^3$ *must equal 5.* | Explain the relationship between the rational exponent, the index of the radical, and the power of the expression.<br><br>Explain the difference between rewriting equivalent expressions by taking the square root of a number and solving an equation which includes a square root, using the principal square root function.<br><br>Compare properties of integer exponents with properties of rational exponents. |
| **A2.N.RN.A.2** Rewrite expressions involving radicals and rational exponents using the properties of exponents. | Write an equivalent expression using rational exponents, given an expression in radical form.<br><br>Write an equivalent expression using radicals, given an expression written exponential form.<br><br>Move fluently between radical and exponential form of expressions.<br><br>Explain the process of changing an expression from radical form to exponential form.<br><br>Explain the process of changing an expression from exponential form to radical form.<br><br>Write an equivalent expression using the properties of exponents, given an expression with rational exponents. |
| **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.<br><br>*Scope and Clarifications:* | Solve square root, cube root, polynomial, rational, and logarithmic equations using multiple solution strategies and explain each step in the solution method.<br><br>Construct a viable argument to justify a chosen solution method used to solve a square root, cube root, polynomial, rational, and logarithmic equation. |

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| *Tasks are limited to square root, cube root, polynomial, rational, and logarithmic functions.* | Compare the steps in each and determine which solution method is most efficient, given an equation with multiple solution methods.<br><br>Explain why an equation has no solution or infinitely many solutions. |
| **A2.A.REI.A.2** Solve rational and radical equations in one variable and identify extraneous solutions when they exist. | Solve rational equations in one variable.<br><br>Solve radical equations in one variable.<br><br>Identify extraneous solutions algebraically.<br><br>Justify solutions graphically using technology. |
| **Honors Addendum:**<br>A2.WCE.2<br>Solve polynomial inequalities. | Solve polynomial inequalities. |

## Quarter 3

| Standards | Evidence of Learning Statements from Instructional Focus Document |
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| **A2.F.BF.A.2** Write arithmetic and geometric sequences with an explicit formula and use them to model situations. ★ | Write an arithmetic explicit formula to model situations, given a real-world context.<br><br>Write a geometric explicit formula to model situations, given a real-world context. |
| **A2.A.SSE.B.3** Recognize a finite geometric series (when the common ratio is not 1) and use the sum formula to solve problems in context. | Identify when a geometric series appropriately describes a given real-world scenario. Identify and calculate when necessary the values of a, r, and n using the sum formula.<br><br>Explain the components in the geometric sum formula. (i.e. where a is the initial value, r is the ratio, and n is the number of terms)<br><br>Identify the components of the geometric sum formula and recognize the implications of the values of a, r, and n by telling how each affects the series.<br><br>Write and use the geometric sum formula to solve contextual problems. |
| **A2.F.LE.A.1** Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a table, a description of a relationship, or input-output pairs.★ | Write a linear function given a graph.<br><br>Write a linear function given a table of values.<br><br>Write a linear function given a description of a simple real-world relationship.<br><br>Write a linear function given a set of input-output pairs (ordered pairs).<br><br>Write an exponential function given a graph.<br><br>Write an exponential function given a table of values.<br><br>Write an exponential function given a description of a simple real-world relationship.<br><br>Write an exponential function given a set of input-output pairs (ordered pairs). |

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| | Write a function given an arithmetic or geometric sequence or a description of one. |
| **A2.A.SSE.B.2** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. ★<br><br>**a.** Use the properties of exponents to rewrite expressions for exponential functions.<br><br>*Scope and Clarifications:*<br>*For example, the expression $1.15^t$ can be rewritten as $((1.15)^{1/12})^{12t} \approx 1.012^{12t}$ to reveal that the approximate equivalent monthly interest rate is 1.2% if the annual rate is 15%.*<br><br>*i. Tasks have a real-world context. As described in the standard, there is an interplay between the mathematical structure of the expression and the structure of the situation such that choosing and producing an equivalent form of the expression reveals something about the situation.*<br><br>ii. Tasks are limited to exponential expressions with rational or real exponents. | Generate an equivalent form of an exponential expression and identify the properties of exponents used to generate the expression from a real-world context. |
| **A2.F.IF.B.3** Graph functions expressed symbolically and show key features of the graph, by hand and using technology.<br><br>**c.** Graph exponential and logarithmic functions, showing intercepts and end behavior. | Graph a square root, cube root, polynomial with degree greater than two, exponential, and logarithmic function by hand and using technology.<br><br>Describe end behavior of a polynomial function with degree greater than two given in standard form and factored form.<br><br>Attend to precision when illustrating intercepts, maxima, minima, and determine the domain, range, and end behavior of a function. |
| **A2.F.IF.B.4** Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.<br><br>**a.** Know and use the properties of exponents to interpret expressions for exponential functions. | Rewrite an exponential function to reveal the percent rate of change.<br><br>Rewrite an exponential function to reveal the y-intercept.<br><br>Write an exponential function given any point and the percent rate of change. |

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| *Scope and Clarifications:*<br>*For example, identify percent rate of change in functions such as y= 2x , y = (1/2)x , y = 2 − x , y = (1/2) − x.* | |
| **A2.F.IF.A.1** 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.<br><br>*Scope and Clarifications:*<br>*Key features include intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; and end behavior.*<br><br>*i. Tasks have a real-world context.*<br><br>*ii. Tasks may involve square root, cube root, polynomial, exponential, and logarithmic functions.* | Identify all evident key features when provided a table of values representing a square root, cube root, polynomial, exponential, or logarithmic function.<br><br>Identify key features of the graph or table and interpret the meaning of the key features in relationship to the context of the problem, given a graph or table of values representing a square root function embedded in a real-world context.<br><br>Identify key features of the graph or table and interpret the meaning of the key features in relationship to the context of the problem, given a graph or table of values representing a cube root function embedded in a real-world context.<br><br>Identify key features of the graph or table and interpret the meaning of the key features in relationship to the context of the problem, given a graph or table of values representing an exponential function embedded in a real-world context.<br><br>Identify key features of the graph or table and interpret the meaning of the key features in relationship to the context of the problem, given a graph or table of values representing a polynomial function embedded in a real-world context.<br><br>Identify key features of the graph or table and interpret the meaning of the key features in relationship to the context of the problem, given a graph or table of values representing a logarithmic function embedded in a real-world context.<br><br>Sketch a graph of the function, given a verbal description of the key features of a square root, cube root, polynomial, exponential, or logarithmic function. |
| **A2.F.IF.B.3** Graph functions expressed symbolically and show key features of the graph, by hand and using technology. | Graph a square root, cube root, polynomial with degree greater than two, exponential, and logarithmic function by hand and using technology. |

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| **c.** Graph exponential and logarithmic functions, showing intercepts and end behavior. | Describe end behavior of a polynomial function with degree greater than two given in standard form and factored form.<br><br>Attend to precision when illustrating intercepts, maxima, minima, and determine the domain, range, and end behavior of a function. |
| **A2.F.IF.B.5** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).<br><br>*Scope and Clarifications:*<br>*Tasks may involve polynomial, exponential, and logarithmic functions.* | Compare properties of two exponential functions each represented in a different way.<br><br>Compare properties of two logarithmic functions each represented in a different way.<br><br>Compare properties of two polynomial functions each represented in a different way.<br><br>Compare properties of two functions from different function families each represented in a different way. |
| **A2.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.<br><br>*Scope and Clarifications:*<br>*i) Tasks may involve polynomial, exponential, and logarithmic functions.*<br><br>*ii) Tasks may involve recognizing even and odd functions.* | Describe the effect on the graph for specific values of k, given two functions, $f(x)$ and$f(x) + k$.<br><br>Describe the effect on the graph for specific values of k, given two functions, $f(x)$ and $kf(x)$.<br><br>Describe the effect on the graph for specific values of k, given two functions, $f(x)$ and $f(x + k)$<br><br>Describe the effect on the graph for specific values of k, given two functions, $f(x)$ and $f(kx)$.<br><br>Determine if the function is an odd function, even function, or neither, given a function defined by an expression.<br><br>Describe multiple effects on a graph for specific values of $a$, $b$, $h$, and $k$ given two functions, $f(x)$ and $af\big(b(x + h)\big) + k$. |

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| | Find the value of k for a specific vertical or horizontal translation, stretch, or compression, given two graphs, the image and pre-image. |
| **A2.A.CED.A.2** Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.<br><br>*Scope and Clarifications:*<br>*i. Tasks are limited to square root, cube root, polynomial, rational, and logarithmic functions.*<br><br>*ii. Tasks have a real-world context.* | Rearrange real-world square root formulas to highlight a quantity of interest.<br><br>Rearrange real-world cube root formulas to highlight a quantity of interest.<br><br>Rearrange real-world non-quadratic polynomial formulas to highlight a quantity of interest.<br><br>Rearrange real-world rational formulas to highlight a quantity of interest.<br><br>Rearrange real-world logarithmic formulas to highlight a quantity of interest. |
| **A2.F.LE.A.2** 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.★ | Identify the components of a logarithmic function and explain how they relate to an exponential function.<br><br>Convert an exponential function into a logarithm function using correct notation.<br><br>Convert a logarithm function into an exponential function using correct notation.<br><br>Evaluate a logarithm using technology.<br><br>Identify and use common logarithms and natural logarithms.<br><br>Attend to precision when defining components and writing a logarithmic function.<br><br>Know when to use a logarithmic function to solve a contextual problem.<br><br>Use a logarithmic function with a base of 2, 10, or e to solve a contextual problem. |
| **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 | Solve square root, cube root, polynomial, rational, and logarithmic equations using multiple solution strategies and explain each step in the solution method. |

| Standards | Evidence of Learning Statements from Instructional Focus Document |
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| argument to justify a solution method.<br><br>*Scope and Clarifications:*<br>*Tasks are limited to square root, cube root, polynomial, rational, and logarithmic functions.* | Construct a viable argument to justify a chosen solution method used to solve a square root, cube root, polynomial, rational, and logarithmic equation.<br><br>Compare the steps in each and determine which solution method is most efficient, given an equation with multiple solution methods.<br><br>Explain why an equation has no solution or infinitely many solutions. |
| **A2.A.CED.A.1** Create equations and inequalities in one variable and use them to solve problems.<br><br>*Scope and Clarifications:*<br>*Include equations arising from linear and quadratic functions, and rational and exponential functions.* | Create and solve a one variable linear, quadratic, rational, or exponential equation that represents a real-world situation.<br><br>Create and solve a one-variable linear, quadratic, rational, or exponential inequality that represents a real-world situation. |
| **A2.S.ID.B.2** Represent data on two quantitative variables on a scatter plot and describe how the variables are related.<br><br>**a.** Fit a function to the data; use the functions fitted to data to solve problems in the context of the data.<br><br>*Scope and Clarifications:*<br>*Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.*<br><br>*i. Tasks have a real-world context.*<br><br>*ii. Tasks are limited to exponential functions with domains not in the integers.* | Fit a quadratic function to a given set of data.<br><br>Fit an exponential function to a given set of data, where exponential functions are limited to domains not in the integers.<br><br>Solve problems using a linear, quadratic, and exponential function, where exponential functions are limited to domains not in the integers, in the context of the data. |
| **A2.N.Q.A.1** Identify, interpret, and justify appropriate quantities for the purpose of descriptive modeling. ★<br><br>*Scope and Clarifications:*<br>*Descriptive modeling refers to understanding and interpreting graphs; identifying extraneous information; choosing appropriate units; etc.* | Identify and interpret information to select or create a quantity to model a real-world problem.<br><br>Describe individual quantities in context of the real-world problem.<br><br>Attend to precision when defining quantities and their units in context. |

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| | Explain and justify the relationship between a solution to a contextual problem and the values used to compute the solution.<br><br>Appropriately interpret, explain the meaning of, and draw conclusions about the quantities in real-world problems.<br><br>Make observations about quantities given a graph or model. Interpret and explain irrelevant or extraneous information in a real-world problem. |
| **A2.F.LE.A.1** Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a table, a description of a relationship, or input-output pairs.★ | Write a linear function given a graph.<br><br>Write a linear function given a table of values.<br><br>Write a linear function given a description of a simple real-world relationship.<br><br>Write a linear function given a set of input-output pairs (ordered pairs).<br><br>Write an exponential function given a graph.<br><br>Write an exponential function given a table of values.<br><br>Write an exponential function given a description of a simple real-world relationship.<br><br>Write an exponential function given a set of input-output pairs (ordered pairs).<br><br>Write a function given an arithmetic or geometric sequence or a description of one. |
| **A2.F.LE.B.3** Interpret the parameters in a linear or exponential function in terms of a context | Explain the meaning of the slope and y-intercept in context of the real-world situation, given a linear function.<br><br>Explain the meaning of the coefficient, the base, and the exponent in context of the real-world situation, given an exponential function with a domain in the integers.<br><br>Predict and determine how a linear function is affected by a change in the |

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| | slope or y-intercept. Explain this change in context.<br><br>Predict and determine how an exponential function is affected by a change in the coefficient, base, or exponent. Explain this change in context. |
| **A2.F.TF.A.1** Understand and use radian measure of an angle.<br><br>**a.** Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.<br><br>**b**. Use the unit circle to find $sin\theta$, $cos\theta$, and $tan\theta$ when $\theta$ is a commonly recognized angle between 0 and $2\pi$.<br><br>*Scope and Clarifications:*<br>*Commonly recognized angles include all multiples n π/6 and n π /4, where n is an integer.* | Explain that a radian measure of an angle is equal to the ratio of the length of the subtended arc of the angle to the radius.<br><br>Draw a unit circle to represent θ and find sin θ, cos θ, and tan θ, given a common radian measure for θ. |
| **A2.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. | Explain why coterminal angles have the same sine, cosine, and tangent values.<br><br>Explain how the unit circle can be used to find the sine, cosine, and tangent of all real numbers.<br><br>Identify sin θ, cos θ, and tan θ when θ is coterminal to a commonly recognized angle on the unit circle, given a graphical representation of theta. |
| **A2.F.TF.B.3** Know and use trigonometric identities to find values of trig functions.<br><br>**a.** Given a point on a circle centered at the origin, recognize and use the right triangle ratio definitions of $sin\theta$, $cos\theta$, and $tan\theta$ to evaluate the trigonometric functions.<br><br>**b.** Given the quadrant of the angle, use the identity $sin^2\theta + cos^2\theta = 1$ to find $sin\theta$ given $cos\theta$, or vice versa.<br><br>*Scope and Clarifications:*<br>*Commonly recognized angles include all multiples n π/6 and n π/4, where n is an integer.* | Recognize and use the right triangle ratio definitions of sin θ, cos θ, and tan θ to evaluate the trigonometric functions, given a point on a circle centered at the origin.<br><br>Know and use the identity sin2 θ + cos2 θ = 1 to find sin θ given cos θ, or vice versa, given the quadrant of θ. |

## 2022 - 2023, HS, Algebra II

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| **Honors Addendum:**<br>A2.WCE.3<br>Graph the three trigonometric functions. | Graph sine, cosine, and tangent functions, including transformations of amplitude, period, phase shift and vertical shift. |

## Quarter 4

| Standards | Evidence of Learning Statements from Instructional Focus Document |
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| **A2.S.CP.A.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"). | Represent sample spaces for compound events as unions, intersections, or complements of other events.<br><br>Use the symbols ∪ and ∩ to represent sample spaces for compound events. |
| **A2.S.CP.B.6** Know and apply the Addition Rule, P(A or B) = P(A) + P(B) – P(A and B), and interpret the answer in terms of the model.<br><br>*Scope and Clarifications:*<br>*For example, in a math class of 32 students, 14 are boys and 18 are girls. On a unit test 6 boys and 5 girls made an A. If a student is chosen at random from a class, what is the probability of choosing a girl or an A student?* | Calculate P(A or B) given two events within a real-world context.<br><br>Interpret P(A or B) in terms of the real-world context. |
| **A2.S.CP.A.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. | Determine if the joint probability of A and B occurring together is equal to the product of their probabilities, and use this characterization to determine if they are independent |
| **A2.S.CP.A.3** Know and 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. | Explain why events A and B are independent if the probability of B given A is the same as the probability of B.<br><br>Explain why the probability of B given A is the same as the probability of B if events A and B are independent. |
| **A2.S.CP.A.4** Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.<br><br>*Scope and Clarifications:*<br>*For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.* | Compare conditional probabilities from a two-way table to decide if the events are independent or not independent.<br><br>Explain why two conditional probabilities from a two-way table with the same conditions means the two events are independent |
| **A2.S.CP.B.5** 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.<br><br>*Scope and Clarifications:*<br>*For example, a teacher gave two exams. 75 percent passed the first quiz and 25 percent passed both. What percent who passed the first quiz also passed the second quiz?* | Use a model (e.g., Venn diagram or table) to represent and solve conditional probability problems. |

## 2022 - 2023, HS, Algebra II

| Standards | Evidence of Learning Statements from Instructional Focus Document |
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| **A2.S.ID.A.1** Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages using the Empirical Rule. | Use the empirical rule to estimate the percent of data above or below various values on the normal curve.<br><br>Use the empirical rule to estimate the percent of data between values on the normal curve. |
| **A2.S.IC.A.1** Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.<br><br>*Scope and Clarifications:*<br>*For example, in a given situation, is it more appropriate to use a sample survey, an experiment, or an observational study? Explain how randomization affects the bias in a study.* | Identify bias in a given study.<br><br>Explain the differences among sample surveys, experiments, and observational studies.<br><br>Describe what type of situations would be most appropriately studied with sample surveys, experiments, and observational studies.<br><br>Explain the limitations of sample surveys, experiments, and observational studies related to randomization. |
| **A2.S.IC.A.2** Use data from a sample survey to estimate a population mean or proportion; use a given margin of error to solve a problem in context. | Use data from a sample survey to estimate a population mean.<br><br>Use data from a sample survey to estimate proportion.<br><br>Solve problems in a contextual situation when given a margin of error. |
| **Honors Addendum:**<br>A2.WCE.4<br>Calculate combinations and permutations.<br><br>A2.WCE.5<br>Find probabilities using combinations and permutations.<br><br>A2.WCE.6<br>Understand how z-scores relate to the normal curve | I can calculate combinations and permutations.<br><br>I can find probabilities using combinations and permutations.<br><br>I understand how z-scores relate to the normal curve. |