Secondary Mathematics III YEAR-AT-A-GLANCE (2018-2019)

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	Core Standard and Objective	**Correlated Assignments**
Quarter 1 Secondary Math 3	**A.APR.1** Understand that all 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. **A.APR.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 $p(x)$. **A.APR.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. **A.APR.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.* **F.IF.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. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.* **F.IF.5** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function* $h(n)$ *gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.* **F.IF.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 zeroes when suitable factorizations are available, and showing end behavior. **F.IF.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.* **N.CN.8** Extend polynomial identities to the complex numbers. *For example, rewrite* $x^2 + 4$ as $(x + 2i)(x - 2i)$. **N.CN.9** Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials. Limit to polynomials with real coefficients. **F.BF.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. Note the effect of multiple transformations on a single function and the common effect of each transformation across function types. Include functions defined only by a graph. 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.* **A.SSE.1** Interpret expressions that represent a quantity in terms of its context. a. Interpret parts of an expression, such as terms, factors, and coefficients. **A.APR.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. **A.APR.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. **A.CED.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. **A.CED.2** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	**This is the suggested order to present Quarter 1 content** **Chapter 2 Linear and Quadratic Functions** 2.1 Parent Functions and transformations 2.5 Transformation of Quadratic Functions 2.6 Characteristics of Quadratic Functions 2.7 Modeling with Quadratic Functions **Chapter 3 Polynomial Functions** 3.1 Graphing Polynomial Functions 3.2 Adding Subtraction and Multiplying Polynomials 3.3 Dividing Polynomials 3.4 Factoring Polynomials 3.5 Solving Polynomial Equations 3.6 The Fundamental Theorem of Algebra 3.7 Transformation of Polynomial Functions 3.8 Analyzing Graphs of Polynomial Functions 3.9 Modeling with Polynomial Functions **Chapter 6 Rational Functions** 6.1 Inverse Variation 6.2 Graphing Rational Functions 6.3 Multiplying and Dividing Ration Expressions 6.4 Adding and Subtraction Rational Expressions 6.5 Solving Rational Expressions

Key Concepts for Differentiation In an effort to assist teachers in the process of differentiation in Tier 1 teaching, key concepts have been identified in the curriculum maps as those specific objectives a teacher would focus on during small group instruction with struggling students. Key concepts cover minimum, basic skills and knowledge every student must master. Key concepts are not an alternative to teaching the entire Utah State Core Standards, rather they emphasize which concepts to prioritize for differentiation.

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	Core Standard and Objective	**Correlated Assignments**
Quarter 2 Secondary Math 3	**F.IF.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. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.* **F.IF.5** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.* **F.IF.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. **F.IF.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. Compare and contrast square root, cubed root, and step functions with all other functions. d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. **A.REI.2** Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. **A.SSE.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 $(x^2-y^2)(x^2 + y^2)$. **F.BF.1** Write a function that describes a relationship between two quantities. 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.* **F.BF.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. Note the effect of multiple transformations on a single function and the common effect of each transformation across function types. Include functions defined only by a graph. 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.* **F.BF.4** Find inverse functions. 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. Include linear, quadratic, exponential, logarithmic, rational, square root, and cube root functions. *For example,* $f(x) = 2x^3$ *or* $f(x) = (x+1)/(x-1)$ for $x \neq 1$. **A.CED.4** Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange the compound interest formula to solve for t:* $A = P(1+r/n)^{nt}$	**This is the suggested order to present Quarter 2 content** **Chapter 4 Rational Exponents and Radical Functions** 4.1 nth Roots and Rational Exponents 4.2 Properties of Rational Exponents and Radicals 4.3 Graphing Radical Functions 4.4 Solving Radical Equations and Inequalities 4.5 Preforming Function Operations 4.6 Inverse Functions **Chapter 8 Trigonometric Ratios and Functions** 8.1 Right Triangle Trigonometry 8.2 Angles and Radian Measure 8.3 Trigonometric Functions of Any Angle 8.4 Graphing Sine and Cosine Functions 8.5 Graphing Other Trigonometric Functions 8.6 Modeling Trigonometric Functions

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Quarter 3 Secondary Math 3	**F.TF.1** Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. **F.TF.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. **FTF.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. **F.TF.5** Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline. **F.TF.7** Use inverse functions to solve trigonometric equations that arise in modelling context; evaluate the solutions using technology and interpret them in terms of context. Limit solutions to a given interval. **G.SRT.9** Derive the formula $A = 1/2\ ab\ sin(C)$ for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side. **G.SRT.10** Prove the Laws of Sines and Cosines and use them to solve problems. **G.SRT.11** Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces). **F.IF.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. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.* **F.IF.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 behavior, and trigonometric functions, showing period, midline, and amplitude. **F.IF.8** Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. **F.LE.3** Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. **F.LE.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. Include the relationship between properties of logarithms and properties of exponents, such as the connection between the properties of exponents and the basic logarithm property that $\log xy = \log x + \log y$. **F.LE.5** Interpret the parameters in a linear, quadratic, or exponential function in terms of a context. Introduce $f(x) = e^x$ as a model for continuous growth. **A.SSE.1** Interpret polynomial and rational expressions that represent a quantity in terms of its context. b. Interpret complex expression by viewing one or more of their parts as a single entity. For example, examine the behavior of $P(1 + r/n)^{nt}$ as n becomes large. **A.SSE.2** Use the structure of an expression to identify ways to rewrite it. **A.CED.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.* **A.REI.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, for example, 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.	**This is the suggested order to present Quarter 3 content** **Chapter 9 Trigonometric Identities and Formulas** 9.1 Using Trigonometric Identities (Honors) 9.2 Using Sum and Difference Formulas (Honors) 9.3 Law of Sines 9.4 Law of Cosines **Chapter 5 Exponential and Logarithmic Functions** 5.1 The Natural Base e 5.2 Logarithms and Logarithmic Functions 5.3 Transformation of Exponential and Logarithmic Functions 5.4 Properties of Logarithms 5.5 Solving Exponential and Logarithmic Equations 5.6 Modeling with Exponential and Logarithmic Functions

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Quarter 4 Secondary Math 3	**G.MG.1** Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). **G.MG.2** Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). **G.MG.3** Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). **G.GMD.4** Identify the shapes of two-dimensional cross-sections of three dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects. **A.CED.3** Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. *For example, maximizing the volume of a box for a given surface area while drawing attention to the practical domain.* **A.SSE.4** Understand the formula for the sum of a geometric series, and use the formula to solve problems. a. Derive the formula for the sum of an arithmetic series. b. Derive the formula for the sum of a geometric series, and use the formula to solve problems. Extended to infinite geometric series. *For example, calculate mortgage payments.* **A.APR.5** 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. *For example, with coefficients determined by Pascal's Triangle.* **S.ID.4** Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. **S.IC.1** Understand that statistics allows inferences to be made about population parameters based on a random sample from that population. **S.IC.3** Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each. **S.IC.4** Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling. **S.IC.6** Evaluate reports based on data.	**This is the suggested order to present Quarter 4 content** **Chapter 1 Geometric Modeling** 1.1 Modeling with Area 1.2 Modeling with Volume 1.3 Cross Sections of Solids 1.4 Solids of Revolution **Chapter 7 Sequences and Series** 7.1 Defining and Using Sequences and Series 7.2 Analyzing Arithmetic Sequences and Series 7.3 Analyzing Geometric Sequences and Series 7.4 Finding Sums of Finite Geometric Series ~~7.5 Using Recursive Rules with Sequences~~ **Chapter 10 Data Analysis and Statistics** 10.1 Using Normal Distributions 10.2 Populations, Samples and Hypotheses 10.3 Collecting Data 10.4 Experimental Design 10.5 Making Inferences and Experiments