DRAFT New Louisiana Standards for 2016-2017 Correlation to *Eureka Math*

Algebra II

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Draft

EUREKA MATH™

Algebra II Mathematics

The majority of the Algebra II Louisiana Standards for Mathematics are fully covered by the Algebra II *Eureka Math* curriculum. The primary areas where the Algebra II Louisiana Standards for Mathematics and *Eureka Math* do not align are in the Algebra, Functions, and Statistics and Probability conceptual categories. Standards for these conceptual categories will require use of *Eureka Math* content from other grade levels or supplemental materials. A detailed analysis of alignment is provided in the table below. With strategic placement of supplemental materials, *Eureka Math* can ensure students are successful in achieving the proficiencies of the Louisiana Standards for Mathematics while benefiting from the coherence and rigor of *Eureka Math*.

Indicators

- Green indicates that the Louisiana standard is fully addressed in *Eureka Math*.
- Yellow indicates that the Louisiana standard may not be completely addressed in *Eureka Math*.
- Red indicates that the Louisiana standard is not addressed in *Eureka Math*.
- Blue indicates there is a discrepancy between the grade level at which this standard is addressed in the Louisiana standards and in *Eureka Math*.

Standards for Mathematical Practice	Aligned Components of *Eureka Math*
1. Make sense of problems and persevere in solving them. High school students start to examine problems by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. By high school, students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. They check their answers to problems using different methods and continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.	Lessons in every module engage students in making sense of problems and persevering in solving them as required by this standard. This standard is analogous to the CCSSM Standard for Mathematical Practice 1, which is specifically addressed in the following modules: ▪ Algebra II M1: Polynomial, Rational, and Radical Relationships ▪ Algebra II M2: Trigonometric Functions ▪ Algebra II M3: Exponential and Logarithmic Functions
2. Reason abstractly and quantitatively. High school students seek to make sense of quantities and their relationships in problem situations. They abstract a given situation and represent it symbolically, manipulate the representing symbols, and pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Students use quantitative reasoning to create coherent representations of the problem at hand; consider the units involved; attend to the meaning of quantities, not just how to compute them; and know and flexibly use different properties of operations and objects.	Lessons in every module engage students in reasoning abstractly and quantitatively as required by this standard. This standard is analogous to the CCSSM Standard for Mathematical Practice 2, which is specifically addressed in the following modules: ▪ Algebra II M1: Polynomial, Rational, and Radical Relationships ▪ Algebra II M2: Trigonometric Functions ▪ Algebra II M3: Exponential and Logarithmic Functions ▪ Algebra II M4: Inferences and Conclusions from Data

Standards for Mathematical Practice	Aligned Components of *Eureka Math*
3. Construct viable arguments and critique the reasoning of others. High school students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. High school students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. High school students learn to determine domains to which an argument applies, listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.	Lessons in every module engage students in constructing viable arguments and critiquing the reasoning of others as required by this standard. This standard is analogous to the CCSSM Standard for Mathematical Practice 3, which is specifically addressed in the following modules: ▪ Algebra II M2: Trigonometric Functions ▪ Algebra II M4: Inferences and Conclusions from Data
4. Model with mathematics. High school students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. High school students making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.	Lessons in every module engage students in modeling with mathematics as required by this standard. This standard is analogous to the CCSSM Standard for Mathematical Practice 4, which is specifically addressed in the following modules: ▪ Algebra II M1: Polynomial, Rational, and Radical Relationships ▪ Algebra II M2: Trigonometric Functions ▪ Algebra II M3: Exponential and Logarithmic Functions ▪ Algebra II M4: Inferences and Conclusions from Data

Standards for Mathematical Practice	Aligned Components of *Eureka Math*
5. Use appropriate tools strategically. High school students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. High school students should be sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. They are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.	Lessons in every module engage students in using appropriate tools strategically as required by this standard. This standard is analogous to the CCSSM Standard for Mathematical Practice 5, which is specifically addressed in the following modules: ▪ Algebra II M1: Polynomial, Rational, and Radical Relationships ▪ Algebra II M4: Inferences and Conclusions from Data
6. Attend to precision. High school students try to communicate precisely to others by using clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. By the time they reach high school they have learned to examine claims and make explicit use of definitions.	Lessons in every module engage students in attending to precision as required by this standard. This standard is analogous to the CCSSM Standard for Mathematical Practice 6, which is specifically addressed in the following modules: ▪ Algebra II M1: Polynomial, Rational, and Radical Relationships ▪ Algebra II M2: Trigonometric Functions ▪ Algebra II M3: Exponential and Logarithmic Functions ▪ Algebra II M4: Inferences and Conclusions from Data

Standards for Mathematical Practice	Aligned Components of *Eureka Math*
7. Look for and make use of structure. By high school, students look closely to discern a pattern or structure. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2×7 and the 9 as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 - 3(x - y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers *x* and *y*. High school students use these patterns to create equivalent expressions, factor and solve equations, and compose functions, and transform figures.	Lessons in every module engage students in looking for and making use of structure as required by this standard. This standard is analogous to the CCSSM Standard for Mathematical Practice 7, which is specifically addressed in the following modules: ▪ Algebra II M1: Polynomial, Rational, and Radical Relationships ▪ Algebra II M2: Trigonometric Functions ▪ Algebra II M3: Exponential and Logarithmic Functions
8. Look for and express regularity in repeated reasoning. High school students notice if calculations are repeated, and look both for general methods and for shortcuts. Noticing the regularity in the way terms cancel when expanding $(x - 1)(x + 1)$, $(x - 1)(x^2 + x + 1)$, and $(x - 1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, derive formulas or make generalizations, high school students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.	Lessons in every module engage students in looking for and expressing regularity in repeated reasoning as required by this standard. This standard is analogous to the CCSSM Standard for Mathematical Practice 8, which is specifically addressed in the following modules: ▪ Algebra II M1: Polynomial, Rational, and Radical Relationships ▪ Algebra II M2: Trigonometric Functions ▪ Algebra II M3: Exponential and Logarithmic Functions

Conceptual Category	Domain	Cluster and Standard	Aligned Components of *Eureka Math*
Number and Quantity	**The Real Number System**	**Cluster A: Extend the properties of exponents to rational exponents.**	
		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* $\left(5^{1/3}\right)^3 = 5^{(1/3)3}$ *to hold,* $5^{(1/3)3}$ *must equal* 5.	Algebra II M3 Lesson 3: Rational Exponents—What are $2^{\frac{1}{2}}$ and $2^{\frac{1}{3}}$? Algebra II M3 Lesson 4: Properties of Exponents and Radicals Algebra II M3 Lesson 5: Irrational Exponents—What are $2^{\sqrt{2}}$ and 2^{π}?
		N-RN.A.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents.	Algebra II M3 Lesson 1: Integer Exponents Algebra II M3 Lesson 2: Base 10 and Scientific Notation Algebra II M3 Lesson 3: Rational Exponents—What are $2^{\frac{1}{2}}$ and $2^{\frac{1}{3}}$? Algebra II M3 Lesson 4: Properties of Exponents and Radicals

Conceptual Category	Domain	Cluster and Standard	Aligned Components of *Eureka Math*
	Quantities	**Cluster A: Reason quantitatively and use units to solve problems.**	
		N-Q.A.2 Define appropriate quantities for the purpose of descriptive modeling.	Algebra II M1 Lessons 16–17: Modeling with Polynomials—An Introduction Algebra II M1 Lessons 20–21: Modeling Riverbeds with Polynomials Algebra II M2 Lesson 12: Ferris Wheels—Using Trigonometric Functions to Model Cyclical Behavior Algebra II M2 Lesson 13: Tides, Sound Waves, and Stock Markets Algebra II M3 Lesson 2: Base 10 and Scientific Notation Algebra II M3 Lesson 6: Euler's Number, e Algebra II M3 Lesson 7: Bacteria and Exponential Growth Algebra II M3 Lesson 9: Logarithms—How Many Digits Do You Need? Algebra II M3 Lesson 23: Bean Counting Algebra II M3 Lesson 27: Modeling with Exponential Functions Algebra II M3 Lesson 28: Newton's Law of Cooling, Revisited Algebra II M3 Topic E: Geometric Series and Finance

Conceptual Category	Domain	Cluster and Standard	Aligned Components of *Eureka Math*
	The Complex Number System	**Cluster A: Perform arithmetic operations with complex numbers.**	
		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.	Algebra II M1 Lesson 37: A Surprising Boost from Geometry
		N-CN.A.2 Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.	Algebra II M1 Lesson 37: A Surprising Boost from Geometry
		Cluster C: Use complex numbers in polynomial identities and equations.	
		N-CN.C.7 Solve quadratic equations with real coefficients that have complex solutions.	Algebra II M1 Lesson 38: Complex Numbers as Solutions to Equations Algebra II M1 Lesson 39: Factoring Extended to the Complex Realm

Conceptual Category	Domain	Cluster and Standard	Aligned Components of *Eureka Math*
Algebra	**Seeing Structure in Expressions**	**Cluster A: Interpret the structure of expressions.**	
		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 $(x^2 - y^2)(x^2 + y^2)$.	Algebra II M1 Topic A: Polynomials—From Base Ten to Base X Algebra II M1 Lesson 12: Overcoming Obstacles in Factoring Algebra II M1 Lesson 13: Mastering Factoring Algebra II M1 Lesson 18: Overcoming a Second Obstacle in Factoring—What If There Is a Remainder? Algebra II M1 Lesson 39: Factoring Extended to the Complex Realm
		Cluster B: Write expressions inequivalent forms to solve problems.	
		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.	
		a. 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%.	Algebra II M3 Lesson 26: Percent Rate of Change Algebra II M3 Lesson 27: Modeling with Exponential Functions

Conceptual Category	Domain	Cluster and Standard	Aligned Components of *Eureka Math*
		A-SSE.B.4 Apply the formula for the sum of a finite geometric series (when the common ratio is not 1) to solve problems. *For example, calculate mortgage payments.*	Algebra II M3 Topic E: Geometric Series and Finance
	Arithmetic with Polynomials and Rational Expressions	**Cluster B: Understand the relationship between zeros and factors of polynomials.**	
		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 $p(x)$.	Algebra II M1 Lesson 19: The Remainder Theorem Algebra II M1 Lesson 40: Obstacles Resolved—A Surprising Result
		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.	Algebra II M1 Lesson 14: Graphing Factored Polynomials Algebra II M1 Lesson 40: Obstacles Resolved—A Surprising Result

Conceptual Category	Domain	Cluster and Standard	Aligned Components of *Eureka Math*
		Cluster C: Use polynomial identities to solve problems.	
		A-APR.C.4 Use polynomial identities 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.*	Algebra II M1 Lesson 2: The Multiplication of Polynomials Algebra II M1 Lesson 3: The Division of Polynomials Algebra II M1 Lesson 7: Mental Math Algebra II M1 Lesson 8: The Power of Algebra—Finding Primes Algebra II M1 Lesson 10: The Power of Algebra—Finding Pythagorean Triples
		Cluster D: Rewrite rational expressions.	
		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.	Algebra II M1 Lesson 4: Comparing Methods—Long Division, Again? Algebra II M1 Lesson 18: Overcoming a Second Obstacle in Factoring—What If There Is a Remainder? Algebra II M1 Lesson 22: Equivalent Rational Expressions Algebra II M1 Lesson 24: Multiplying and Dividing Rational Expressions Note: The use of technology is not addressed in these lessons so supplementation is required.

Conceptual Category	Domain	Cluster and Standard	Aligned Components of *Eureka Math*
	Creating Equations	**Cluster A: Create equations that describe numbers or relationships.**	
		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.*	Algebra II M1 Lesson 26: Solving Rational Equations Algebra II M1 Lesson 27: Word Problems Leading to Rational Equations Algebra II M3 Lesson 7: Bacteria and Exponential Growth Algebra II M3 Lesson 27: Modeling with Exponential Functions Note: Consider using lessons from Algebra I M1 Topic D to address equations arising from linear functions and Algebra I M4 Lesson 7 to address equations arising from quadratic functions.
	Reasoning with Equations and Inequalities	**Cluster A: Understand solving equations as a process of reasoning and explain the reasoning.**	
		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.	Algebra II M1 Lesson 26: Solving Rational Equations Algebra II M1 Lesson 28: A Focus on Square Roots

Conceptual Category	Domain	Cluster and Standard	Aligned Components of *Eureka Math*
		A-REI.A.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.	Algebra II M1 Lesson 26: Solving Rational Equations Algebra II M1 Lesson 27: Word Problems Leading to Rational Equations Algebra II M1 Lesson 28: A Focus on Square Roots Algebra II M1 Lesson 29: Solving Radical Equations
		Cluster B: Solve equations and inequalities in one variable.	
		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	Algebra II M1 Lesson 26: Solving Rational Equations Algebra II M1 Lesson 29: Solving Radical Equations Algebra II M1 Lesson 31: Systems of Equations Algebra II M1 Lesson 38: Complex Numbers as Solutions to Equations

Conceptual Category	Domain	Cluster and Standard	Aligned Components of *Eureka Math*
		Cluster C: Solve systems of equations.	
		A-REI.C.6 Solve systems of linear equations exactly and approximately (e.g., with graphs), limited to systems of at most three equations and three variables. With graphic solutions, systems are limited to two variables.	Algebra II M1 Lesson 30: Linear Systems in Three Variables Algebra II M1 Lesson 31: Systems of Equations Note: Consider supplementing with lessons from G8 M4 Topic D to address graphing systems of linear equations.
		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* $x^2 + y^2 = 3$.	Algebra II M1 Lesson 31: Systems of Equations Algebra II M1 Lesson 32: Graphing Systems of Equations
		Cluster D: Represent and solve equations and inequalities graphically.	
		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.	Algebra II M1 Lesson 31: Systems of Equations Algebra II M3 Lesson 24: Solving Exponential Equations Note: Consider supplementing with lessons from Algebra I M3 Topic C and Algebra I M4 Topic A to address the relationship between intersection points of the graphs and solutions to the equations.

Conceptual Category	Domain	Cluster and Standard	Aligned Components of *Eureka Math*
Functions	**Interpreting Functions**	**Cluster B: Interpret functions that arise in applications in terms of the context.**	
		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. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.*	Algebra II M1 Lesson 14: Graphing Factored Polynomials Algebra II M1 Lesson 15: Structure in Graphs of Polynomial Functions Algebra II M1 Lesson 17: Modeling with Polynomials—an Introduction Algebra II M2 Lesson 8: Graphing the Sine and Cosine Functions Algebra II M2 Lesson 10: Basic Trigonometric Identities from Graphs Algebra II M2 Lesson 14: Graphing the Tangent Function Algebra II M3 Lesson 17: Graphing the Logarithm Function Algebra II M3 Lesson 18: Graphs of Exponential Functions and Logarithmic Functions Algebra II M3 Lesson 20: Transformations of the Graphs of Logarithmic and Exponential Functions

Conceptual Category	Domain	Cluster and Standard	Aligned Components of *Eureka Math*
		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.	Algebra II M3 Lesson 6: Euler's Number, *e* Algebra II M3 Lesson 26: Percent Rate of Change
		Cluster C: Analyze functions using different representations.	
		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.	Algebra I M3 Topic C: Transformations of Functions Algebra I M3 Lesson 24: Piecewise and Step Functions in Context Algebra I M4 Lesson 18: Graphing Cubic, Square Root, and Cube Root Functions Algebra I M4 Lesson 19: Translating Functions Algebra I M4 Lesson 20: Stretching and Shrinking Graphs of Functions
		c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.	Algebra II M1 Lesson 14: Graphing Factored Polynomials Algebra II M1 Lesson 15: Structure in Graphs of Polynomial Functions

Conceptual Category	Domain	Cluster and Standard	Aligned Components of *Eureka Math*
		e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.	Algebra II M2 Lesson 8: Graphing the Sine and Cosine Functions Algebra II M2 Lesson 9: Awkward! Who Chose the Number 360, Anyway? Algebra II M2 Lesson 10: Basic Trigonometric Identities from Graphs Algebra II M2 Lesson 11: Transforming the Graph of the Sine Function Algebra II M2 Lesson 14: Graphing the Tangent Function Algebra II M3 Topic C: Exponential and Logarithmic Functions and their Graphs Algebra II M3 Lesson 33: The Million Dollar Problem

Conceptual Category	Domain	Cluster and Standard	Aligned Components of *Eureka Math*
		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. 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	Algebra II M3 Lesson 23: Bean Counting Algebra II M3 Lesson 26: Percent Rate of Change Algebra II M3 Lesson 27: Modeling with Exponential Functions Algebra II M3 Topic E: Geometric Series and Finance
		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, determine which has the larger maximum.*	Algebra II M3 Lesson 27: Modeling with Exponential Functions Algebra II M3 Lesson 28: Newton's Law of Cooling Algebra II M3 Lesson 30: Buying a Car Algebra II M3 Lesson 31: Credit Cards Algebra II M3 Lesson 33: The Million Dollar Problem Note: Consider supplementing with Algebra I M3 Lesson 21: Comparing Linear and Exponential Models Again and Algebra I M4 Lesson 22: Comparing Quadratic, Square Root, and Cube Root Functions Represented in Different Ways.

Conceptual Category	Domain	Cluster and Standard	Aligned Components of *Eureka Math*
	Building Functions	**Cluster A: Build a function that models a relationship between two quantities.**	
		F-BF.A.1 Write a function that describes a relationship between two quantities.	
		a. Determine an explicit expression, a recursive process, or steps for calculation from a context.	Algebra II M1 Lesson 1: Successive Differences in Polynomials Algebra II M2 Lesson 12: Ferris Wheels—Using Trigonometric Functions to Model Cyclical Behavior Algebra II M2 Lesson 13: Tides, Sound Waves, and Stock Markets Algebra II M3 Lesson 5: Irrational Exponents—What are $2^{\sqrt{2}}$ and 2^{π}? Algebra II M3 Lesson 6: Euler's Number, e Algebra II M3 Lesson 7: Bacteria and Exponential Growth Algebra II M3 Lesson 22: Choosing a Model Algebra II M3 Lesson 26: Percent Rate of Change Algebra II M3 Lesson 27: Modeling with Exponential Functions

Conceptual Category	Domain	Cluster and Standard	Aligned Components of *Eureka Math*
		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.	Algebra II M3 Lesson 28: Newton's Law of Cooling, Revisited Algebra II M3 Lesson 30: Buying a Car Algebra II M3 Lesson 33: The Million Dollar Problem
		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.	Algebra II M3 Lesson 25: Geometric Sequences and Exponential Growth and Decay Algebra II M3 Lesson 26: Percent Rate of Change Algebra II M3 Topic E: Geometric Series and Finance Note: Consider supplementing with Algebra I M3 Topic A, which provides opportunities to write both arithmetic and geometric sequences recursively and explicitly and to model situations with them.

Conceptual Category	Domain	Cluster and Standard	Aligned Components of *Eureka Math*
		Cluster B: Build new functions from existing functions.	
		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.*	Algebra II M1 Lesson 34: Are All Parabolas Congruent? Algebra II M1 Lesson 35: Are All Parabolas Similar? Algebra II M2 Lesson 11: Transforming the Graph of the Sine Function Algebra II M2 Lesson 14: Graphing the Tangent Function Algebra II M3 Lesson 20: Transformations of the Graphs of Logarithmic and Exponential Functions Algebra II M3 Lesson 21: The Graph of the Natural Logarithm Function

Conceptual Category	Domain	Cluster and Standard	Aligned Components of *Eureka Math*
		F-BF.B.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. For example, $f(x) = 2x^3$ or $f(x) = (x + 1)/(x - 1)$ for $x \neq 1$.	Algebra II M1Lesson 27: Word Problems Leading to Rational Equations Algebra II M3 Lesson 7: Bacteria and Exponential Growth Algebra II M3 Lesson 8: The "WhatPower" Function Algebra II M3 Lesson 19: The Inverse Relationship Between Logarithmic and Exponential Functions Algebra II M3 Lesson 24: Solving Exponential Equations Note: Consider supplementing with lessons from Precalculus and Advanced Topics M3 Topic C for writing expressions for inverses for a variety of functions.

Conceptual Category	Domain	Cluster and Standard	Aligned Components of *Eureka Math*
	Linear, Quadratic, and Exponential Models	**Cluster A: Construct and compare linear, quadratic, and exponential models and solve problems.**	
		F-LE.A.2 Given a graph, a description of a relationship, or two input-output pairs (include reading these from a table) construct linear and exponential functions, including arithmetic and geometric sequences, to solve multi-step problems.	Algebra II M3 Lesson 1: Integer Exponents Algebra II M3 Lesson 22: Choosing a Model Algebra II M3 Topic D: Using Logarithms in Modeling Situations Algebra II M3 Topic E: Geometric Series and Finance Note: Consider supplementing with the lessons in Algebra I M3 Topics A and B to address linear functions.

Conceptual Category	Domain	Cluster and Standard	Aligned Components of *Eureka Math*
		F-LE.A.4 For exponential models, express as a logarithm the solution to $a \cdot b^{ct} = d$ where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.	Algebra II M3 Lesson 12: Properties of Logarithms Algebra II M3 Lesson 13: Changing the Base Algebra II M3 Lesson 14: Solving Logarithmic Equations Algebra II M3 Lesson 15: Why Were Logarithms Developed? Algebra II M3 Lesson 19: The Inverse Relationship Between Logarithmic and Exponential Functions Algebra II M3 Lesson 24: Solving Exponential Equations Algebra II M3 Lesson 27: Modeling with Exponential Functions Algebra II M3 Lesson 28: Newton's Law of Cooling, Revisited

Conceptual Category	Domain	Cluster and Standard	Aligned Components of *Eureka Math*
		Cluster B: Interpret expressions for functions in terms of the situation they model.	
		F-LE.B.5 Interpret the parameters in a linear, quadratic, or exponential function in terms of a context.	Algebra II M3 Lesson 22: Choosing a Model Algebra II M3 Topic D: Using Logarithms in Modeling Situations Algebra II M3 Topic E: Geometric Series and Finance Note: Consider supplementing with lessons in Algebra I M3 Topic D, which address linear and exponential functions. Consider supplementing with Algebra I M4 Lessons 23 and 24, which address interpreting parameters of a quadratic function in terms of a context.
	Trigonometric Functions	**Cluster A: Extend the domain of trigonometric functions using the unit circle.**	
		F-TF.A.1 Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.	Algebra II M2 Lesson 9: Awkward! Who Chose the Number 360, Anyway?
		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.	Algebra II M2 Topic A: The Story of Trigonometry and Its Contexts

Conceptual Category	Domain	Cluster and Standard	Aligned Components of *Eureka Math*
		Cluster B: Model periodic phenomena with trigonometric functions.	
		F-TF.B.5 Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.	Algebra II M2 Lesson 12: Ferris Wheels—Using Trigonometric Functions to Model Cyclical Behavior Algebra II M2 Lesson 13: Tides, Sound Waves, and Stock Markets Algebra II M3 Lesson 22: Choosing a Model
		Cluster C: Prove and apply trigonometric identities.	
		F-TF.C.8 Prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta)\theta = 1$and use it find $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ given $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ and the quadrant.	Algebra II M2 Lesson 15: What Is a Trigonometric Identity?
Statistics and Probability	**Interpreting Categorical and Quantitative Data**	**Cluster A: Summarize, represent, and interpret data on a single count or measurement variable.**	
		S-ID.A.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.	Algebra II M4 Lesson 10: Normal Distributions Algebra II M4 Lesson 11: Normal Distributions

Conceptual Category	Domain	Cluster and Standard	Aligned Components of *Eureka Math*
		Cluster B: Summarize, represent, and interpret data on two categorical and quantitative variables.	
		S-ID.B.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.	
		a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. *Use given functions or choose a function suggested by the context. Emphasize exponential models.*	Algebra II M2 Lesson 13: Tides, Sound Waves and Stock Markets Algebra II M3 Lesson 23: Bean Counting Algebra II M3 Lesson 27: Modeling with Exponential Functions
	Making Inferences and Justifying Conclusions	**Cluster A: Understand and evaluate random processes underlying statistical experiments.**	
		S-IC.A.1 Understand statistics as a process for making inferences to be made about population parameters based on a random sample from that population	Algebra II M4 Topic C: Drawing Conclusions Using Data from a Sample
		S-IC.A.2 Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. *For example, a model says a spinning coin falls heads up with probability* 0.5. *Would a result of* 5 *tails in a row cause you to question the model?*	Algebra II M4 Lesson 1: Chance Experiments, Sample Spaces, and Events Note: Consider supplementing with additional opportunities to carry out simulations of events (using objects like coins or dice or random number generators) and comparing the results to theoretical probabilities.

Conceptual Category	Domain	Cluster and Standard	Aligned Components of *Eureka Math*
		Cluster B: Make inferences and justify conclusions from sample surveys, experiments, and observational studies.	
		S-IC.B.3 Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.	Algebra II M4 Lesson 12: Types of Statistical Studies Algebra II M4 Lesson 23: Experiments and the Role of Random Assignment
		S-IC.B.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.	Algebra II M4 Topic C: Drawing Conclusions Using Data from a Sample
		S-IC.B.5 Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.	Algebra II M4 Topic D: Drawing Conclusions Using Data from an Experiment
		S-IC.B.6 Evaluate reports based on data.	Algebra II M4 Lesson 22: Evaluating Reports Based on Data from a Sample Algebra II M4 Lesson 30: Evaluating Reports Based on Data from an Experiment