IM 3 Unit 5 Plan 2023 - 2024

Course: IM 3	Unit: 5 - Exponential and Logarithmic Functions and Relations
Time: 20 Days (Jan 3-31)	**Essential Standards: A.CED.2, A.REI.11, F.IF.7e, F.BF.3**
Previous Standard: F.IF.1 Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x). F.IF.3 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1) for n ≥ 1.	**Future Standard:** N/A
Standards for Mathematical Practice: 1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.	**Student Learning Targets:** 1. **I can** create exponential equations to represent relationships between quantities. (A.CED.2) 2. **I can** find the approximate solutions to f(x)=g(x) using different methods. (A.REI.11) 3. **I can** graph logarithmic functions, showing intercepts and end behavior. (A.CED.2, F.IF.7e) 4. **I can** graph transformations of exponential and logarithmic functions and write the equations for these functions from the graph. (A.CED.2, F.IF.7e, F.BF.3) (Important to know) 6. **I can** rewrite an equation of the form $ab^{ct}=d$ using a logarithm. (F.LE.4)

Standards	Vocabulary	Skills	Activities (Resources)	Assessment

Essential Standard ★Indicates a modeling standard linking mathematics to everyday life, work, and decision-making				
A.CED.2★ **Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.**	Equations Variables Exponential Relationships Axes ○ Coordinate ○ Labels ○ Scales	● Create equations in two or more variables ● Represent relationships between quantities ● Graph equations	Click here to see sample SBAC question(s)	
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, 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.**	Points, coordinates of Intersection of graphs Equations ○ Exponential ○ logarithmic Solutions Approximation with ○ Technology ○ Tables of values	● Find solutions with approximation ○ using technology to graph the functions, ○ make tables of values, or ○ find successive approximations.	MGH 6-4 Ext	
Standard: F.IF.7e★ **Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude*.**	Graphs of functions and their key features: Exponential functions Logarithmic function Zeros End behavior	● Graph functions by hand or with technology as needed ● Show key features of the following types of function graphs: ○ Square root ○ Cube root ○ Piecewise ○ Polynomial ○ Exponential	MGH 6-1 Click here to see sample SBAC question(s)	

F.BF.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.**	Translations, dilations, and reflections, i.e., the effect on graphs of replacing f(x) by a. f(x) + k, b. kf(x), c. f(kx), and d. f(x + k)	For functions f(x) replaced by o f(x) + k o kf(x) o f(kx) o f(x + k) ▪ Identify the effect on graphs ▪ Find the value of k given a graph ▪ Experiment with cases ▪ Illustrate an explanation of	MGH 6-1	
Important to Know Standard ★Indicates a modeling standard linking mathematics to everyday life, work, and decision-making				
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.				
F.BF.4a 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.	Inverse functions	• Graph inverse functions from the graph of the original function • Compute the inverse function from the formula of an original function		
Reflection: *List strategies or 'things to remember" when teaching when planning the unit. After the unit, document what worked well and what needs to change for the next year.* Inverse Functions can be covered here or in Unit 4				

Monday	Tuesday	Wednesday	Thursday	Friday
		3 **PBIS** **Properties of Exponents** I can use properties of exponents to simplify expressions.	**4** **Properties of Exponents** I can use properties of exponents to simplify expressions.	**5** **Properties of Exponents** I can use properties of exponents to simplify expressions.
8 **Modeling with Exponential Functions: Exponential Growth/Exponential Decay/Compound Interest** I can interpret exponential functions as growth or decay. I can solve equations involving compound interest formulas.	**9** **Graph Exponential Functions** I can identify exponential functions represented in equations, tables, or graphs. I can apply transformations to graph an exponential function.	**10** **Graph Exponential Functions** I can apply transformations to graph an exponential function.	**11** **CFA 1 A.CED.2** **Solve Exponential Equations and Equations with Rational Exponents** I can use properties of exponents to solve an exponential equation. I can solve equations with rational exponents.	**12** **Flex Day** **Solve Exponential Equations and Equations with Rational Exponents** I can use properties of exponents to solve an exponential equation. I can solve equations with rational exponents.
15 **HOLIDAY**	**16** **Rewrite Logarithms** **Evaluate Logarithms** I can convert a logarithmic equation from logarithmic to exponential form.	**17** **Properties of Logarithms (Change of Base/Condense/Expand Logarithms)** I can use the change of base formula to evaluate a logarithmic expression.	**18** **Properties of Logarithms (Condense/Expand Logarithms)** **Solve Logarithmic Equations**	**19** **Solve Logarithmic Equations** I can use the properties of logarithms to solve a logarithmic equation.

	I can convert an exponential equation from an exponential to logarithmic form. I can evaluate a logarithmic expression.	I can use the properties of logarithms to rewrite expressions as the sum and difference of logarithms. I can use the properties of logarithms to rewrite sums, differences as a single logarithm.	I can use the properties of logarithms to rewrite expressions as the sum and difference of logarithms. I can use the properties of logarithms to rewrite sums, differences as a single logarithm. I can use the properties of logarithms to solve a logarithmic equation.	
22 **Solve Logarithmic Equations** I can use the properties of logarithms to solve a logarithmic equation.	**23** **Graph Logarithmic Functions** I can apply transformations to graph a logarithmic function.	**24** **Graph Logarithmic Functions** I can apply transformations to graph a logarithmic function.	**25** **Graph Logarithmic Equation** **CFA 2 (F.IF.7e, F.BF.3)** I can apply transformations to graph a logarithmic function.	**26** **Flex Day** **Modeling with Logarithmic Functions: Continuous Growth, Continuous Decay, Continuous Compound Interest** I can use logarithms to solve problems involving exponential growth and decay. I can solve equations involving compound interest formulas.
29 **Modeling with Logarithmic Functions -**	**30** **Review**	**31** **Unit Test**		

Continuous Growth, Continuous Decay, Continuous Compound Interest I can use logarithms to solve problems involving exponential growth and decay. I can solve equations involving compound interest formulas.				