

Algebra II Part 2: Exponential & Logarithmic Behavior

Stage 1 Desired Results		
ESTABLISHED GOALS: <u>Competencies:</u> - Students will demonstrate the ability to simplify algebraic expressions and equations by applying the properties of operations and arithmetic of complex numbers. - Students will demonstrate the ability to solve equations, inequalities and systems by analyzing structure and applying the properties of equality and rational expressions. - Students will demonstrate the ability to apply functions to solve problems in a variety of contexts by interpreting and analyzing multiple representations of functions. - Students will demonstrate the ability to model real world problems by building and analyzing the appropriate expression, equation, or function. - Students will demonstrate the ability to analyze and summarize text and integrate knowledge to make meaning of discipline-specific materials. - Students will demonstrate the ability to produce coherent and supported writing in order to communicate effectively for a range of discipline-specific tasks, purposes, and audiences. - Students will demonstrate the ability to speak purposefully and effectively by strategically making decisions about content, language use, and discourse style. <u>Content Standards:</u> - F.IF.C.7.E Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. - A.SSE.A.1.A Interpret parts of an expression, such as terms, factors, and coefficients. - A.SSE.A.1.B Interpret complicated expressions by viewing one or more of their parts as a single entity. - A.CED.A.1 Create equations and inequalities in one variable and use them to solve problems. - A.CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. - A.CED.A.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. - 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	Transfer	
	<i>Students will be able to independently use their learning to make informed decisions based upon their understanding of exponential growth or decay.</i>	
	Meaning	
	ENDURING UNDERSTANDINGS <i>Students will understand that...</i> - a constant percent increase or decrease applied at regular intervals always results in an exponential relationship between two quantities. - an inverse function reverses the effect of the original function.	ESSENTIAL QUESTIONS How do different factors alter an outcome?
	Acquisition	
	<i>Students will know...</i> - the parent functions for exponential and logarithmic functions. $A(t) = a(1 - r)^t$. - the properties of exponents. - that a function and its inverse are reflections across the line $y=x$. - the Product Property of Logarithms. - the Quotient Property of Logarithms. - the Power Property of Logarithms. - the Inverse Properties of Logarithms and Exponents. - the Change of Base Formula. - that an exponential or logarithmic function can be represented as a graph, table, and equation. - that exponential and logarithmic functions are inverses of each other. - the recursive rule for an arithmetic sequence. - the recursive rule for geometric sequence. $a_n = a_1 + (n - 1)d$. $a_n = a_1 r^{n-1}$. - the formula for geometric mean. - summation notation.	<i>Students will be skilled at...</i> - adding using the properties of exponents in order to simplify, multiply, divide, raise a power to a power or distribute. - applying their knowledge of exponents to numbers in scientific notation. - writing inverses of multi-step functions. - graphing the inverse of a function. - using the properties of logarithms in order to simplify expressions involving logs, including multiply, divide, or raise a logarithm to an exponent or change a base. - modeling real world situations with exponential functions. - graphing exponential and logarithmic functions from their equations. - knowing how to find, identify, and interpret key points (starting point, asymptotes, shape, etc.) of various exponential functions. - rewriting logarithmic functions as exponential functions and vice versa. - solving exponential and logarithmic equations with same and different bases. - writing recursive and explicit formulas for

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. - F.IF.C.8.B Use the properties of exponents to interpret expressions for exponential functions. - F.IF.C.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). - F.BF.A.1.A Determine an explicit expression, a recursive process, or steps for calculation from a context. - F.BF.A.1.B Combine standard function types using arithmetic operations. - F.BF.B.4.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. - F.LE.A.4 For exponential models, express as a logarithm the solution to $abct = d$ where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology. - A.SSE.B.4 Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. - MP2 Reason abstractly and quantitatively. - MP4 Model with mathematics. - MP7 Look for and make use of structure. - MP8 Look for and express regularity in repeated reasoning.	<u>vocabulary:</u> <i>exponent, exponential function/equation, scientific notation, asymptote, exponential growth/decay, growth/decay rate, growth/decay factor, compound interest, principal interest, inverse function, logarithm, logarithm function/equation, inverse function, arithmetic sequence, arithmetic series, geometric sequence, geometric series, geometric mean</i>	<i>arithmetic sequences.</i> <i>calculating the sum of the first n terms of a arithmetic series.</i> <i>writing recursive and explicit formulas for geometric sequences.</i> <i>calculating the sum of the first n terms of a geometric series.</i> <i>calculating the sum of an infinite geometric series</i> <i>using induction to prove statements.</i>
Content Area Literacy Standards		21st Century Skills
- RST.11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. - RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. - RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to <i>grades 11-12 texts and topics</i>.		<i>reason effectively</i> <i>use systems thinking</i> <i>apply technology effectively</i> <i>make judgments and decisions</i> <i>solve problems</i> <i>access and evaluate information</i>

Stage 2 - Evidence	
Evaluative Criteria	Assessment Evidence
	PERFORMANCE TASK(S):
	OTHER EVIDENCE:

Stage 3 – Learning Plan

Summary of Key Learning Events and Instruction

Language Arts Integration

- 1.OA.1 Use

Mathematics Integration

- 1.OA.1 Use

Technology Integration

- 1.OA.1 Use

District Materials