*Unit 4 Exponential & Logarithmic Functions

Content Area: **Mathematics**
Course(s): **Trigonometry and Analytical Geometry**
Time Period: **January**
Length: **10 Blocks**
Status: **Published**

Transfer Skills

Students will manipulate expressions involving exponents and logarithms to create equivalent expressions.

Enduring Understandings

Function families have common characteristics.

We can use algebra to help graph functions.

Knowing how to read an equation is essential for graphing the function.

Mathematics applies to the sciences.

Essential Questions

How can an exponential function represent a real-world scenario?

How can properties of logarithms be used to solve equations?

Why does simplifying or expanding a logarithmic expression help us solve problems?

Why is the number e important?

Content

Vocabulary:

Euler's number (e)

Logarithm

Expand

Condense

Initial Value

Percent Growth Factor

Skills

Evaluate exponential functions.

Graph exponential growth and decay functions.

Change exponential expressions to logarithmic expressions and logarithmic expressions to exponential expressions.

Evaluate exponential functions and logarithmic functions.

Solve exponential functions and logarithmic functions.

Define the number e.

Expand and condense logarithmic expressions.

Use properties of logarithms and exponents to solve equations algebraically with a variety of bases.

Find the inverses of exponential and logarithmic functions.

Use exponential and logarithmic functions to describe real world scenarios including growth and decay.

Graph logarithmic functions.

Resources

Content Vocabulary

Practices quizzes

Teacher website

www.KhanAcademy.org

www.Desmos.com

Standards

Interpreting Functions F-IF

C. Analyze functions using different representations

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.

Linear and Exponential Models□ F-LE

A. Construct and compare linear and exponential models and solve problems

4. Understand the inverse relationship between exponents and logarithms. 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.

MP1 Make sense of problems and persevere in solving them.

Mathematically proficient students start 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. Mathematically proficient 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. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

MP6 Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about 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. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

MP8 Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y – 2)/(x – 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x – 1)(x + 1)$, $(x – 1)(x2 + x + 1)$, and $(x – 1)(x3 + x2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

MA.F-IF	Interpreting Functions
MA.F-IF.C	Analyze functions using different representations

MA.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.
MA.F-IF.C.7e	Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.
MA.F-LE	Linear and Exponential Models
MA.F-LE.A	Construct and compare linear and exponential models and solve problems
MA.F-LE.A.4	Understand the inverse relationship between exponents and logarithms. For exponential models, express as a logarithm the solution to □□ to the □□ power = □ where □, □, and □ are numbers and the base □ is 2, 10, or □; evaluate the logarithm using technology.