Unit 7: Advanced Functions and Relations, Rational Exponents

Content Area: **Mathematics**
Course(s): **Algebra 2H**
Time Period: **April**
Length: **4 weeks**
Status: **Published**

Unit Overview

- • Analyze change in various contexts
- • Represent and analyze mathematical situations and structures using algebraic symbols
- • Understand patterns, relations and functions

Enduring Understandings

- • Exponential and logarithmic functions are closely related.
- • Exponential and logarithmic functions can be used to model real-life situations.
- • Exponential functions and graphs display varying rates of change
- • Points of discontinuity and asymptotes
- • The relationship between exponential functions and logarithmic functions
- • There is more than one way to solve an exponential function

Essential Questions

- How can functions be used to model real-life situations?
- When do quantities have a nonlinear relationship?
- Where can you find Exponential Decay in the real world?
- Where can you find Exponential Growth in the real world?

Student Learning Objectives

- SWBAT define and use the natural logarithm function
- SWBAT define logarithmic functions and to learn how they are related to exponential functions
- SWBAT extend the meaning of exponents to include irrational numbers and to define exponential functions
- SWBAT extend the meaning of exponents to include rational numbers
- SWBAT find the composite of two given functions and to find the inverse of a given function
- SWBAT lean and apply the basic properties of logarithms
- SWBAT use common logarithms to solve equations involving powers and to evaluate logarithms with any given base

- SWBAT use exponential and logarithmic functions to solve growth and decay problems

Lesson Titles

- Exponential Growth and Decay
- Introduction to Logarithms and their Relationship to Exponential Fucntions
- Properties of Logarithms
- Rational Exponents
- Real Exponents
- The Natural Logarithm

Standards

MA.F-IF	Interpreting Functions
MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.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.
MA.F-LE	Linear and Exponential Models
MA.F-LE.B	Interpret expressions for functions in terms of the situation they model
MA.A-REI.D	Represent and solve equations and inequalities graphically

Indicators

MA.A-SSE.B.3c	Use the properties of exponents to transform expressions for exponential functions.
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-IF.C.8b	Use the properties of exponents to interpret expressions for exponential functions.
MA.F-LE.A.1a	Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.
MA.F-LE.A.1c	Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.
MA.F-LE.A.2	Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).
MA.F-LE.A.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.
MA.F-LE.A.4	Understand the inverse relationship between exponents and logarithms. For exponential models, express as a logarithm the solution to ab to the ct power = d where a, c, and d

	are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.
MA.F-LE.B	Interpret expressions for functions in terms of the situation they model
MA.F-LE.B.5	Interpret the parameters in a linear or exponential function in terms of a context.
MA.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.

Career Readiness, Life Literacies & Key Skills

TECH.9.4.2.CI.1	Demonstrate openness to new ideas and perspectives (e.g., 1.1.2.CR1a, 2.1.2.EH.1, 6.1.2.CivicsCM.2).
TECH.9.4.2.CI.2	Demonstrate originality and inventiveness in work (e.g., 1.3A.2CR1a).
TECH.9.4.2.CT.3	Use a variety of types of thinking to solve problems (e.g., inductive, deductive).
TECH.9.4.2.DC.3	Explain how to be safe online and follow safe practices when using the internet (e.g., 8.1.2.NI.3, 8.1.2.NI.4).
TECH.9.4.2.TL.2	Create a document using a word processing application.
TECH.9.4.2.TL.3	Enter information into a spreadsheet and sort the information.

Inter-Disciplinary Connections

LA.RST.11-12.9	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
LA.W.9-10.6	Use technology, including the Internet, to produce, share, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.
9-12.HS-ETS1-4.5	Using Mathematics and Computational Thinking

Instructional Strategies/Learning Activities/Levels of Blooms

- Review quiz
- Review test
- students will be 5 questions. they will hand these problems in by the end of the period.
- Assessment
- Intro. Applications of logarithms
- Intro. composite functions
- Intro. Exponential decay
- Intro. exponential growth
- Intro. exponents that are irrational numbers
- Intro. how to algebraically find an inverse function

- Intro. how to find logarithms of any base
- Intro. how to graphically find an inverse function
- Intro. how to solve equations involving logarithms
- Intro. inverse functions
- Intro. laws of logarithms
- Intro. Logarithms
- Intro. rational exponents
- Intro. solving exponential equations
- Intro. the Natural Logarithm function
- review 5 questions collect previous day.
- Review Anticipatory Set
- review game
- review hmwk

Modifications

ELL Modifications

- Assess ELL students continuously using formative assessment methods
- Be flexible with time frames and deadlines
- During Delsea One - one on one with a student who speaks the same language
- Intentional scheduling/grouping with student/teacher who speaks the same language if possible
- Khan Academy offers lesson in several languages https://es.khanacademy.org/
- Offer resources for specific topics in primary language (Youtube web resources)
- Repeat, reword, clarify
- Use google translator, especially for application problems
- Using technology, such as but not limited to: graphing calculator and desmos

IEP & 504 Modificaitons

- Allowing co-teaching with general education and special education teachers in the same classroom so that the special education teacher can re-teach students with special needs in a different way in a smaller group (pulled to the side)
- For assessments - allowing student to correct mistakes or answer wrong questions correctly for additional credit if failed the first test (another way to re-teach material)
- For assessments - rewording questions so that there are not higher level vocabulary within the question (you are testing for understanding of the content not the ability to understand the question)
- For assessments - students could use calculator and/or other math tools (x grids, chips, ect)

- If not in a co-teaching setting allowing time in the schedule for a special education teacher to consult with general education teachers on what specifically can be modified or how to paraphrase things in a different way specific to that lesson
- Khan Academy offers extra practice and examples in all areas. https://www.khanacademy.org/
- Modeling and showing lots of examples
- Non-verbal redirection of behaviors
- Providing study guides that don't lead the student to study too much extraneous information (less unnecessary details)/scaffolded study guides
- Scaffolded notes
- Speaking to students privately when redirecting behaviors
- Videos that offer extra practice and examples in all areas are posted on google classroom and taken from: mathispower4u

G & T Modifications

- Ask students' higher level questions that require students to look into causes, experiences, and facts to draw a conclusion or make connections to other areas of learning
- Determine where students' interests lie and capitalize on their inquisitiveness. (Is there a Invite students to explore different points of view on a topic of study and compare the two. Specific career they are interested in? How would this apply to their interest?)
- Employ differentiated curriculum to keep interest high
- Encourage students to explore concepts in depth and encourage independent studies or investigations
- Encourage students to make transformations- use a common task or item in a different way
- Invite students to explore different points of view on a topic of study and compare the two
- Khan Academy offers extra practice and examples in all areas. https://www.khanacademy.org/
- Provide additional rigorous challenge problems for advanced students
- Refrain from having them complete more work in the same manner
- Videos that offer extra practice and examples in all areas are posted on google classroom and taken from: mathispower4u

At Risk Modifcations

- Keep in contact with parents/guardians and guidance counselor on progress
- Refer to Organizational Management
- Require Delsea One Tutoring

Formative Assessment

- Anticipatory Set
- Closure
- Partner activity
- Pass out of class

- Quiz on Exponential Growth and Decay
- Quiz on Logarithms and their Properties
- Quiz on rational and real exponents
- Warm Up

Summative Assessment

- Benchmark Assessment
- Marking Period Assessment
- Unit Test on Logarithms (Chapter 10)

Resources & Materials

- Algebra and Trigonometry Book 2
- Establish a set of general strategies for student independence and self-evaluation
- Evoke student participation from their seats and at the board
- Independent/Cooperative learning explorations
- Mathispower4u math videos
- Powerpoint lessons
- Smartboard lessons
- Teacher Generated Worksheets
- Use youtube videos to introduce/demonstrate concepts in real-life situations.

Technology

- Chromebooks
- Desmos
- Equatio
- Graphing Calculators
- MathXLforschool.com

TECH.8.1.12.A.CS1	Understand and use technology systems.
TECH.8.1.12.E.CS3	Evaluate and select information sources and digital tools based on the appropriateness for specific tasks.
TECH.8.2.12.A.CS3	The relationships among technologies and the connections between technology and other fields of study.