Unit 1: Functions

Content Area: **Math**
Course(s):
Time Period:
Length: **10 Days**
Status: **Published**

State Mandated Topics Addressed in this Unit

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N/A	N/A

Functions

Learning Objectives

- (+) Use the inverse relationship between exponents and logarithms to solve problems involving logarithms and exponents.
- 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.★
- Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- Choose and interpret the scale and the origin in graphs and data displays.
- Choose and interpret units consistently in formulas.
- Define appropriate qualities for the purpose of descriptive modeling.
- Find inverse functions. 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) =2 x3 or f(x) = (x+1)/(x–1) for x ≠1.
- 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.★
- Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.★
- 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.
- Use units as a way to understand problems and to guide the solution of multi-step problems.
- Write a function that describes a relationship between two quantities.★ (+) Compose functions. For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather

balloon as a function of time.

Essential Skills

- Apply scales to graphs, origin of graph and data displays.
- Apply scales to multi-step problems and formulas.
- Calculate the average rate of change of a function from a graph or a function on an interval.
- Choose limits on measurements when reporting quantities.
- Choose the level of accuracy.
- Choose units in formulas.
- Compose functions.
- Define quantities for descriptive modeling problems. (Incorporate appropriate units)
- Estimate the average rate of change from a graph.
- Evaluate logarithms using technology.
- Express exponential models as a logarithm with solutions in a particular base.
- Find inverse functions.
- Interpret key features from a graph or a table of values.
- Interpret the average rate of change.
- Interpret units in formulas.
- Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.
- Relate the domain of a function its graph.
- Relate the domain of a function to the quantitative relationship that it describes.
- Sketch a graph using the key features of a function.
- Solve equations to find an inverse.
- Understand the inverse relationship between exponents and logarithms.
- Use the inverse relationship between exponents and logarithms to solve problems.
- Use units to make sense of solutions.
- Verify inverse functions using composition.
- Write an expression for an inverse function

Standards

MATH.9-12.F.BF.A.1.c	Compose functions.
MATH.9-12.N.Q.A.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
MATH.9-12.N.Q.A.2	Define appropriate quantities for the purpose of descriptive modeling.
MATH.9-12.N.Q.A.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

MATH.9-12.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.
MATH.9-12.F.BF.B.4.b	Verify by composition that one function is the inverse of another.
MATH.9-12.F.BF.B.5	Use the inverse relationship between exponents and logarithms to solve problems involving logarithms and exponents.
MATH.9-12.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.
MATH.9-12.F.IF.B.5	Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.
MATH.9-12.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.
MATH.9-12.F.LE.A.4	Understand the inverse relationship between exponents and logarithms. 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.

Instructional Tasks/Activities

- Activity 10
- Activity 2
- Activity 3
- Activity 4
- Activity 5
- Activity 6
- Activity 7
- Activity 8
- Activity 9
- Topic #5: Inverse Functions

Assessment Procedure

- Class Discussions
- Classroom Total Participation Technique
- Classwork/homework
- Compare/Contrast Journals
- DBQ
- Electronic Active Responders
- Essay
- Exit Ticket/Entrance Ticket/Do Now
- Identify the Error Problems
- Journal / Student Reflection
- Kahoot

- Other named in lesson
- Peer Review
- Performance
- Problem Correction
- Project
- Quiz
- Quizzes/Tests
- Response and Analysis Questions
- Rubric
- Teacher Collected Data
- Teacher Observations
- Test
- Worksheet

Recommended Technology Activities

- Appropriate Content Specific Online Resource
- Chromebook
- Copy/Paste Content Specific Link Here
- Copy/Paste Content Specific Link Here
- Copy/Paste Content Specific Link Here
- Desmos
- Gimkit
- GoGuardian
- Google Classroom
- Google Docs
- Google Forms
- Google Slides
- Kahoot
- MagicSchool AI
- Other- Specified in Lesson
- Quiziz
- Screencastify
- TI-Nspire CX-Cas Activities

Accommodations & Modifications & Differentiation

Accommodations and Modifications should be used to meet individual needs. Their IEP and 504 plans should be used in addition to the following suggestions.

Special Education

- 1. Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA)
- 2. Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
- 3. Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- 4. Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- 5. Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- 6. Use project-based science learning to connect science with observable phenomena.
- 7. Structure the learning around explaining or solving a social or community-based issue.
- 8. Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.

Gifted and Talented

- Compare & Contrast
- Conferencing
- Debates
- Jigsaw
- Peer Partner Learning
- Problem Solving
- Structured Controversy
- Think, Pair, Share
- Tutorial Groups

Instruction/Materials

- alter format of materials (type/highlight, etc.)
- color code materials
- eliminate answers
- extended time
- extended time
- large print
- modified quiz

- modified test
- Modify Assignments as Needed
- Modify/Repeat/Model directions
- necessary assignments only
- Other (specify in plans)
- other- named in lesson
- provide assistance and cues for transitions
- provide daily assignment list
- read class materials orally
- reduce work load
- shorten assignments
- study guide/outline
- utilize multi-sensory modes to reinforce instruction

Environment

- alter physical room environment
- assign peer tutors/work buddies/note takers
- assign preferential seating
- individualized instruction/small group
- modify student schedule (Describe)
- other- please specify in plans
- provide desktop list/formula

Honors Modifications

In this unit, we explore in much greater depth, the behaviors of these functions through a graphical approach with the inclusion of Slant Asymptotes found by method of polynomial long division. Honors level Pre-Calculus students are also expected to persevere through a number of application and synthesis word problems found in the college level Pre-Calculus: A Concise Course textbook by Larson and Hostetler.

Resources

- http://www.corestandards.org/the-standards/mathematics
- https://njctl.org/courses/math/pre-calculus/
- Infinite Pre-calculus