

Logarithmic Functions - Engaging Resources

RF SO4,5,6 Logarithmic Functions Concept Summary Sheet

(Download: [Logarithms Concept Map.pdf](#))

This chart may help students see the big picture and the connections within the topic.

Logarithmic Functions

Evaluate + Estimate Logarithms

A logarithm is an exponent: $y = \log_b x \leftrightarrow b^y = x$
 (Logarithmic Form) (Exponential Form)

Evaluate + Estimate Logarithms

Mentally
 $\log_4 50 \approx [2.7]$

Change of Base Identity
 $\log_4 50 = \frac{\log 50}{\log 4} \approx [2.8]$

$$\log_a b = \frac{\log b}{\log a}$$

Laws of Logarithms

Product Law - $\log_b (M \cdot N) = \log_b M + \log_b N$

Quotient Law - $\log_b \left(\frac{M}{N}\right) = \log_b M - \log_b N$

Power Law - $\log_b (M^n) = n \cdot \log_b M$

Use laws to simplify or expand logarithmic expressions.

Solve Exponential Equations

Previously

Common Base

$$2^x = 4$$

$$2^x = 2^2$$

$$x = 2$$

Graphically

$$y_1 = 2^x$$

$$y_2 = 4$$

CALC INTERSECT

Using Logarithms

Change Form

$$2^x = 4$$

$$x = \log_2 4$$

$$x = \frac{\log 4}{\log 2}$$

Log Both Sides

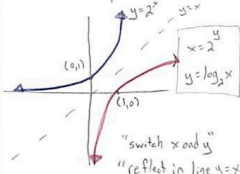
$$\log 2^x = \log 4$$

$$x \log 2 = \log 4$$

$$x = \frac{\log 4}{\log 2}$$

Logarithmic Function - $y = \log_b x$

Inverse of Exponential Function



Types of Logarithmic Functions

Increasing

$b > 1$



D: $x > 0, x \in \mathbb{R}$
 R: $y \in \mathbb{R}$

Decreasing

$0 < b < 1$



x-int: one (after x=1)
 y-int: none

Modelling

Perform a logarithmic regression with Graphing Calculator.

9: LnReg $\rightarrow y = a + b \ln x$

$\ln x$ = natural logarithm
 $= \log_e x$

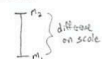
e is a special irrational #

Applications

- Earthquakes, Acidity, Loudness, ...
- Logarithmic Scale: an increase of 1 on the scale is 10 times the value.
- Types of Problems

\rightarrow Use given equation and variable to solve for unknown variable.

\rightarrow Comparison: $\frac{I_1}{I_2} = 10^{\text{difference on scale}}$



RF SO4 - Online Logger Game

(Link: [Logger Game](#))

This online game gives students an opportunity to practice laws of logarithms.

