

Section 7 - 3

Logarithmic Functions
as Inverses

Students will be able to:

- write and evaluate logarithmic expressions
- graph log functions

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Khan Academy Video-
Introduction into Logs

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Definition of a Logarithm

$$\underline{b^y = x} \text{ if and only if } \underline{\log_b x = y}$$

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Converting to Log Form:
(same thing as giving the inverse)

$$36 = 6^2$$

$$\log_6 36 = 2$$

$$\frac{8}{27} = \left(\frac{2}{3}\right)^3$$

$$\log_{\frac{2}{3}} \frac{8}{27} = 3$$

$$1 = 3^0$$

$$\log_3 1 = 0$$

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Evaluating Logs:

-write in exponential form to find the value

What is the value of each log?

1). $\log_5 125 = 3$

2). $\log_4 32 = x$

$$4^x = 32$$

$$(2^2)^x = 2^5$$

$$2^{2x} = 2^5$$

$$2x = 5$$

$$x = \frac{5}{2}$$

3). $\log_{64} \frac{1}{32} = x$

$$64^x = \frac{1}{32}$$

$$2^{6x} = 2^{-5}$$

$$2^{6x} = 2^{-5}$$

$$6x = -5$$

$$x = -\frac{5}{6}$$

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A common log is in a base 10.

-written as log x

Many measurements of physical phenomena have such a wide range of values, that the reported measurements are logarithms (exponents) of the value. Example: Richter Scale

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Comparing Intensity of Earthquakes:

$$\log \frac{I_1}{I_2} = M_1 - M_2$$

I is intensity
 M is magnitude

In 1995, an earthquake in Mexico was 8.0. In 2001, Washington state had a 6.8. How many more times intense was the 1995 earthquake?

Solve for $\frac{I_1}{I_2}$

$$\log \frac{I_1}{I_2} = 8.0 - 6.8$$

$$\log \frac{I_1}{I_2} = 1.2$$

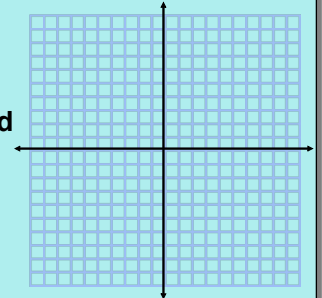
$$10^{1.2} = \frac{I_1}{I_2}$$

15.85 X's as intense

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The logarithmic function is the inverse of the exponential function. Their graphs are reflections about the line $y = x$.

Graph: $y = \log x$.
What is the domain, range, y-intercept, and asymptote?



Graph $y = 3^x$ also.

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Exponential and Logarithmic Functions are inverses of each other. To give the inverse, just convert to the other form.

Give the inverse of the following:
 $y = \log(4x + 1)$

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Hwk: pg. 456 - 457
#12, 18, 20 - 32 evens, 42,
50, 52, 62, 68, 76

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