

MHF 4UI UNIT 4 Exponential and Logarithmic Functions

Day 3 - Logarithmic Functions

Solve the following equation for x: $11 = 3(2^x)$

This equation can be solved by trial and error, by using a graphical approximation, or by using logarithms. Logarithmic functions are related to exponential functions in a special way.

LOGARITHMIC FORM

EXPONENTIAL FORM

$$\log_b x = y \quad \longleftrightarrow \quad b^y = x$$

Example 1: Evaluate each of the following:

a) $\log_3 9 = ? \longleftrightarrow 3^? = 9$

b) $\log_2 32 = ? \longleftrightarrow 2^? = 32$

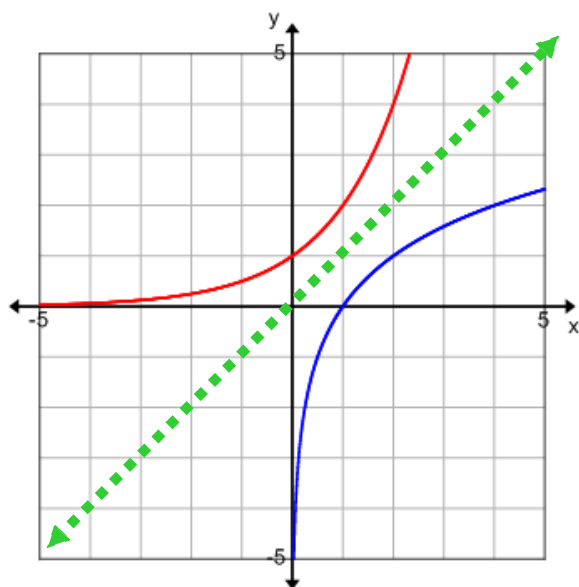
c) $\log_4 \frac{1}{16} = \quad \longleftrightarrow \quad 4^? = \frac{1}{16}$

d) $\log_3 x = 4 \longleftrightarrow 3^4 = x$

e) $\log_x 16 = 4 \longleftrightarrow x^4 = 16$

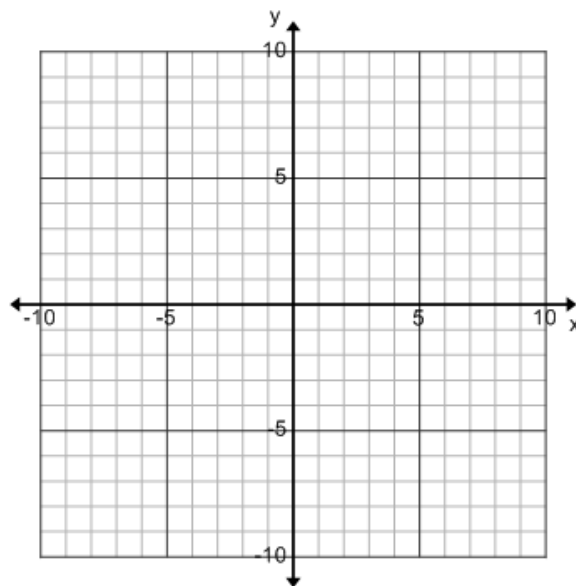
The function $y = a^x$ is the inverse of $y = \log_a x$
(That is they are reflections in the line $y = x$)

Example $y = 2^x$ and $y = \log_2 x$



Example 2: Graph the following function:

$$y = \log_3 (x + 1) - 2$$



Example 3: Calculate the value of y:

$$a) y = 3^{\log_3 7}$$

$$b) y = 12^{\log_{12} 8}$$



$$c) y = \log_{12} 12^8$$

$$\log_a a^x = x$$

** To bring an x that is an exponent down, take the logarithm of both sides.

SUMMARY of Logarithm Properties:

$$\log_a 1 =$$

$$\log_a a =$$

$$\log_a a^x =$$

$$a^{\log_a x} =$$