

Section 13.2 (Logarithmic Functions)

Objective #1: Let's study the inverse of exponential functions (logarithmic functions)

Consider the function:

$$f(x) = 2^x$$

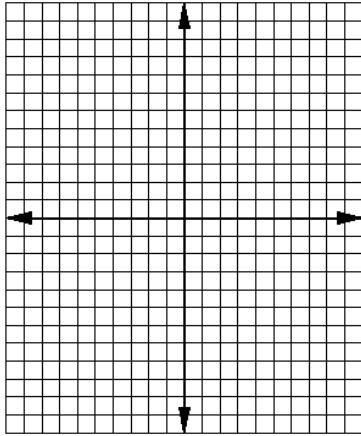
$$y = 2^x \quad \text{another way to write it}$$

$$x = 2^y \quad \text{To find its inverse we exchange } x \text{ and } y$$

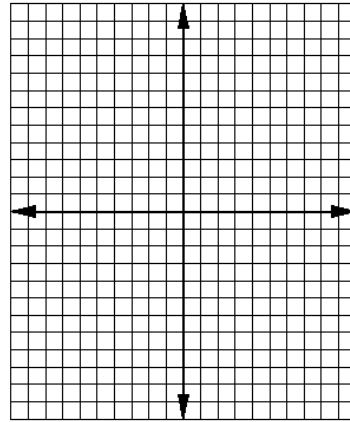
In this last statement we say that the inverse function  $f^{-1}(x)$  is the power we raise 2 to in order to get  $x$ .

Mathematicians call this  $y = \log_2 x$

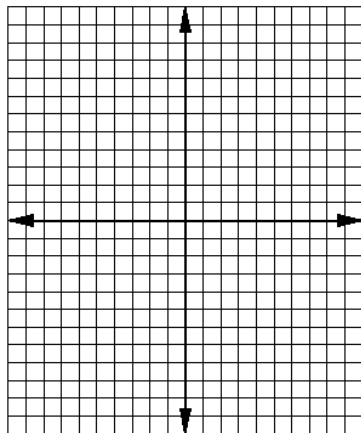
Graph  $y = \log_{10} x$



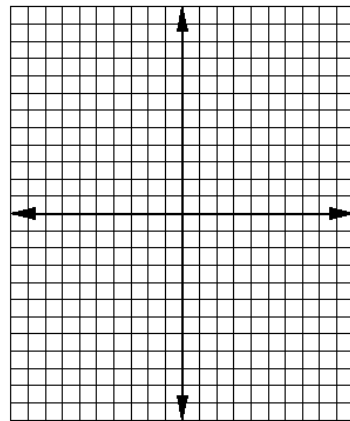
Compare to the graph of  $y = 10^x$



Graph  $y = \log_3 x$



Compare to the graph of  $y = 3^x$



Section 13.2 (Logarithmic Functions)

**To convert from exponential to logarithmic form we say if:**

When  $a^y = x$  then  $y = \log_a x$

**A logarithm is an exponent!!!**

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Find the value of the given logarithm without using a calculator.

I'm asking you, "What power do I raise 10 to in order to get 1000"?

$$\log_{10} 1000 =$$

I'm asking you, "What power do I raise 2 to in order to get 32"?

$$\log_2 32 =$$

I'm asking you, "What power do I raise 3 to in order to get 81"?

1.  $\log_3 81 =$

2.  $\log_4 1 =$

3.  $\log_{13} 1 =$

4.  $\log_9 9 =$

5.  $\log_{16} 64 =$

6.  $6^{\log_6 13}$

Section 13.2 (Logarithmic Functions)

Write the logarithmic form of the given exponential equations.

7.  $10^2 = 100$

8.  $16^{3/4} = 8$

9.  $4^{-5} = \frac{1}{1024}$

10.  $p^m = V$

11.  $e^{-4} = 0.0183$

Write the exponential form of the given logarithmic equations.

12.  $\log_7 10 = h$

13.  $\log_6 6 = 1$

14.  $\log_{10} 0.01 = -2$

15.  $\log_{10} 3 = 0.4771$

16.  $\log_b n = 23$

Section 13.2 (Logarithmic Functions)

Find the value of  $x$ .

17.  $\log_4 x = 2$

18.  $\log_x 64 = 3$

19.  $\log_5 5 = x$

20.  $\log_4 16 = x$

21.  $\log_x 7 = 1$

22.  $\log_9 x = 1$

23.  $\log_3 x = -2$

24.  $\log_{32} x = \frac{2}{5}$

Notice:

$\log_{10} 1 =$

$\log_{10} 10 =$

$\log_{10} 100 =$

$\log_{10} 1000 =$

$\log_{10} 10000 =$