

Unit 9 Notes Obj. 2

A logarithmic operation (log) is simply the process of answering the question.....

"what power makes this work?"

You've already done some of the easier concepts.

Evaluate the following logarithms.

1.  $\text{Log}_3 243 = x$

$$3^x = 243$$
$$3^5 = 243 \quad \boxed{x=5}$$

2.  $\text{Log}_4 \sqrt[5]{4} = x$

$$4^x = \sqrt[5]{4}$$
$$4^x = 4^{\frac{1}{5}} \quad \boxed{x = \frac{1}{5}}$$

3.  $\text{Log}_2 (1/16) = x$

$$2^x = \frac{1}{16}$$
$$\boxed{x = -4}$$

4.  $\text{Log}_4 (0.25) = x$

$$4^x = 0.25$$
$$4^x = \frac{1}{4} \quad \boxed{x = -1}$$

5.  $\text{Log}_{625} 5 = x$

$$625^x = 5$$
$$5^{4x} = 5^1$$
$$4x = 1 \quad \boxed{x = \frac{1}{4}}$$

The Common Log: When a log base is not shown, the base is 10

6.  $\text{Log}_{10} 100 = x$

$$10^x = 100$$
$$\boxed{x = 2}$$

7.  $\text{Log}_{10} 0.001 = x$

$$10^x = 0.001$$
$$10^x = \frac{1}{1,000}$$
$$\boxed{x = -3}$$

8.  $\text{Log}_{10} 10^5 = x$

$$10^x = 10^5$$
$$\boxed{x = 5}$$

The Natural Log: When a log is written with the letters "ln" it's the natural log.  $\log_e \rightarrow \ln$

The natural log uses the irrational number e. Like  $\pi$ , "e" is a ratio which appears quite frequently in nature.

9.  $\ln 1 = x$

$$e^x = 1$$
$$\boxed{x = 0}$$

10.  $\ln \frac{1}{\sqrt[3]{e}} = x$

$$e^x = \frac{1}{\sqrt[3]{e}}$$
$$e^x = e^{-\frac{1}{3}} \quad \boxed{x = -\frac{1}{3}}$$

11.  $\ln \sqrt[5]{e^7} = x$

$$e^x = \sqrt[5]{e^7}$$
$$e^x = e^{\frac{7}{5}} \quad \boxed{x = \frac{7}{5}}$$

Between what two integers would you find:

$$\log_7 20,000 = x$$

$$7^x = 20,000 \quad \text{between 5 and 6}$$

$$7^5 = 16,807$$

$$7^6 = 117,649$$

Find the y-intercept for the following functions:

Reminder: How do you find the y-intercept?

$$\text{set } x = 0$$

$$y = 3 \log_5 (x + 25) + 7$$

$$y = 3 \cdot \log_5 (0 + 25) + 7$$

$$y = 3 \cdot \log_5 (25) + 7$$

$$y = 3 \cdot 2 + 7$$

$$\boxed{y = 13} \quad (0, 13)$$

$$y = \log_4 (x + 1) + 6$$

$$y = \log_4 (0 + 1) + 6$$

$$y = \log_4 (1) + 6$$

$$y = \overset{\vee}{0} + 6$$

$$\boxed{y = 6} \quad (0, 6)$$