# 8.4 Logarithms and Logarithmic Functions

Find x in the following problems.

a) 
$$2^{x} = 4$$

b) 
$$2^{x} = .5$$

c) 
$$2^x = 8$$

d) 
$$2^x = 6$$

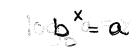
$$X = -1$$

Let b and y be positive numbers, b≠1.

The logarithm of y with base b is denoted by  $\log_b y$  and is defined as follows:

$$\log_b y = x$$
 if and only if  $b^x = y$ 

# **Converting Logarithmic Equations and Exponential Equations**





**Exponential Form** 

Logarithmic Form

Rewrite the equation in either exponential or logarithmic form.

Exponential Form	Logarithmic Form
a <sup>5</sup> =3a	$\log_2 32 = 5$
$6^{-2} = \frac{1}{36}$	$\log_{\omega} \frac{1}{3\omega} = -2$
104 = 10,000	$\log_{10} 10,000 = 4$
$5^3 = 125$	log = 125 = 3
$7^0 = 1$	109-1=0
4°=1	$\log_4 1 = 0$

# **Evaluating Logarithmic Expressions**

a) 
$$\log_{10} 100 =$$

b) 
$$\log_5 \frac{1}{5} = \frac{1}{1}$$

c) 
$$\log_{15} 1 =$$

$$5^{x} = \frac{1}{5}$$

d) 
$$\log_3 \frac{1}{27} = -3$$

e) 
$$\log_4(-64) = \frac{1}{2} \cos^2 7$$

f) 
$$\log_2 8 = 3$$

$$3^{x} = \frac{1}{27}$$

does not

$$a^{\lambda} = 8$$

#### **Common Logarithm**

### **Natural Logarithm**

base 10

Use your calculator to evaluate each expression. Round to 3 decimal places.

base 10

base 10

# **Change of Base:**

$$\log_{0} a = \frac{\log_{0} a}{\log_{0} b}$$

Change to base
10 so you can
use calculator

b) 
$$\log_{1/4} 256 =$$

c) 
$$\log_{10} 0.001 = -3$$