

# Honors Algebra II

## Notes Section 4.4

### Evaluate Logarithms and Graph Logarithmic Functions

#### VOCABULARY

Logarithm of y with base b:  $\log_b y = x$  or  $b^x = y$

Common logarithm: logarithm with a base of 10;  $\log x = \log_{10} x$

Natural logarithm: logarithm with a base of e;  $\ln x = \ln_e x$

Inverse Functions:  $\log_b b^x = x$  and  $b^{\log_b x} = x$

Logarithmic Translations:  $y = \log_b(x-h) + k$

**EXAMPLE 1** Rewrite the logarithmic equations to exponential form.

a)  $\log_2 8 = 3$  \_\_\_\_\_

b)  $\log_4 1 = 0$  \_\_\_\_\_

c)  $\log_{12} 12 = 1$  \_\_\_\_\_

d)  $\log_{1/4} 4 = -1$  \_\_\_\_\_

**EXAMPLE 2** Evaluate the logarithm.

a)  $\log_4 64$  \_\_\_\_\_

b)  $\log_5 0.2$  \_\_\_\_\_

c)  $\log_{1/5} 125$  \_\_\_\_\_

d)  $\log_{36} 6$  \_\_\_\_\_

**EXAMPLE 3** Evaluate using a calculator.

a)  $\log 8$  \_\_\_\_\_

b)  $\ln 0.3$  \_\_\_\_\_

**EXAMPLE 4** The wind speed  $s$  (in mph) near the center of a tornado can be modeled by

$$s = 93 \log d + 65$$

where  $d$  is the distance (in miles) that the tornado travels.  
 In 1925, a tornado traveled 220 miles through 3 states. Estimate the wind speed near the tornado's center.

$$s = 93 \log d + 65$$

**EXAMPLE 5** Simplify the expression.

a)  $10^{\log 4}$  \_\_\_\_\_

b)  $\log_5 25^x$  \_\_\_\_\_

**EXAMPLE 6** Find the inverse of the function.

a)  $y = 6^x$  \_\_\_\_\_

b)  $y = \ln(x+3)$

### Parent Graphs of Logarithmic Functions

I.  $f(x) = \log_b x$  for  $b > 1$

II.  $f(x) = \log_b x$  for  $0 < b < 1$



