Name ______________________________ Date ______________

Exponential and Log Functions

Notes: Lesson 2

A logarithmic (log) function is the INVERSE of an exponential function. In other words, if you had a variable in the exponent and were trying to solve for that variable, you may use a log function in the solving process.

We can use the following rule to convert between a log function and an exponential function:

$$\boxed{\log_b m = n \iff b^n = m}$$

Example 1... Write each equation in logarithmic form.

a. $5^2 = 25$

b n m

$\log_5 25 = 2$

b. $10^3 = 1000$

b n m

$\log_{10} 1000 = 3$

$\log 1000 = 3$

c. $729 = 3^6$

m b n

$\log_3 729 = 6$

d. $7.389 = e^2$

m b n

$\log_e 7.389 = 2$

↓

$\ln 7.389 = 2$

Example 2... Write each equation in exponential form.

a. $\log_2 8 = 3$

b m n

$2^3 = 8$ (true)

b. $\log 100 = 2$

$\log_{10} 100 = 2$

b m n

$10^2 = 100$

c. $\ln 5 = 1.609$

$\log_e 5 = 1.609$

b m n

$e^{1.609} = 5$

d. $\log_5 625 = 4$

b m n

$5^4 = 625$

set equal to x

Example 3... **Evaluate each logarithm.**

a. $\log_4 16 = x$

$4^x = 16$

$x = 2$

b. $\log_3 \frac{1}{9} = x$

$3^x = \frac{1}{9}$

$x = -2$

c. $\log_9 27 = x$

$9^x = 27$

$(3^2)^x = 3^3$

$3^{2x} = 3^3$

$2x = 3$

$x = 3/2$

d. $\ln e^6$

$\log_e e^6 = x$

$e^x = e^6$

$x = 6$

Example 4... **Find the inverse of each logarithmic function.**

a. $y = \log_5 x$

$x = \log_5 y$

$5^x = y$

$y = 5^x$

b. $y = \log_2 (x + 3)$

$x = \log_2(y+3)$

$2^x = y + 3$

$-3 \qquad -3$

$y = 2^x - 3$

c. $y = \ln x + 7$

$x = \ln y + 7$

$-7 \qquad -7$

$x - 7 = \ln y$

$x - 7 = \log_e y$

$e^{x-7} = y$

$y = e^{x-7}$