2.2 Defining a Logarithm

Complete Investigate Pg.74

Log Key: The log key converts any value into a base of 10 raised to some exponent.

For example: log 400 = 2.602059991

$$400 = 10^{2.60206}$$

log 0.35 = -0.455932

$$0.35 = 10^{-0.455932}$$

log (-10) = ERROR Why?????

$\cancel{10^{?} = -10}$

We cannot take the log of any negative #.

Logarithms do not have to be restricted to just base 10. They can be any positive number base. For example, $\log_2 16$. Let's look at evaluating logarithms of other bases.

logarithmic form

$\log_2 8 = 3$ $\qquad$ $\log_7 2401 = 4$

This means $2^3 = 8$ $\qquad$ *This means* $7^4 = 2401$

exponential form

Let's generalize this. We can write any logarithmic function as an exponential function and vica versa. **We use the following rule:**

$$\boxed{\log_a x = y \qquad a^y = x}$$

Write each of the following in exponential form

$\log_3 81 = 4$ $3^4 = 81$

$\log_2 0.25 = -2$ $2^{-2} = 0.25$

$\log_a b = c$ $a^c = b$

Write each of the following in logarithmic form

$5^3 = 125$ $\log_5 125 = 3$

$2^{-3} = \frac{1}{8}$ $\log_2 \frac{1}{8} = -3$

$x^y = z$ $\log_x z = y$

Evaluate each logarithm → Find the # answer.

$\log_4 64 = x$

$\log_3 243 = x$

* your calculator only evaluates base 10 logs.

* If you cannot evaluate a log convert it to exponential form.

$4^x = 64$

$x = 3$

$3^x = 243$

$x = 5$

Pg. 78 4, 6-8