2.2 Logarithms

A logarithm base b of a positive number x satisfies the following:

For $b > 0, b \neq 1, log_b x = y$ if and only if $b^y = x$

Writing exponential equations in logarithmic form:

USE:

$x = b^y$ then $log_b x = y$

base

$$x = b^y \qquad log_b x = y$$

$$100 = 10^2$$

$\log_{10} 100 = 2$

$b = 10$

$x = 100$

$y = 2$

$$x = b^y \qquad log_b x = y$$

$$81 = 3^4$$

$b = 3$

$x = 81$

$y = 4$

$\log_3 81 = 4$

$x = b^y$ $\log_b x = y$

$36 = 6^2$!

b = b

x = 36

y = 2

$\log_6 36 = 2$

$$\frac{8}{27} = \left(\frac{2}{3}\right)^3$$

$b = \frac{2}{3}$

$x = \frac{8}{27}$

$y = 3$

$$\log_{\frac{2}{3}} \frac{8}{27} = 3$$

What is the value of $\log_8 32$?

$x = b^y$ $\quad\quad$ $log_b x = y$

$b = 8$

$x = 32$

$y = ?$

$32 = 8^y$

$2^{(5)} = 2^{(3)y}$

IF the bases are the same, set the exponents equal to each other

$\frac{5}{3} = \frac{3(y)}{3}$

$y = \frac{5}{3}$

$\log_5 125$?

$b = 5$

$x = 125$

$y = ?$

$125 = 5^x$

$5^3 = 5^x$

$3 = x$

$\log_4 32$

$b = 4$

$x = 32$

$y = ?$

$32 = 4^x$

$2^{(5)} = 2^{2(x)}$

$\frac{5}{2} = \frac{2x}{2}$

$\boxed{x = \frac{5}{2}}$

$x = b^y$ $\log_b x = y$

$\log_9 27$

$x = 27$

$b = 9$

$y = ?$

$27 = 9^x$

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

$\frac{3}{2} = \frac{2x}{2}$

$x = \frac{3}{2}$

$$x = b^y \qquad log_b x = y$$

$$\log_8 256$$

$b = 8$

$x = 256$

$y = x$

$256 = 8^x$

$2^8 = 2^{3x}$

$\frac{8}{3} = \frac{3x}{3}$

$x = 8/3$

1. What is something you learned today?

2. What is something you are still struggling with?

3. Graph the following with the parent function. Describe the change.

$$f(x) = 2 \cdot 3^x$$

9, 10, 11, 15