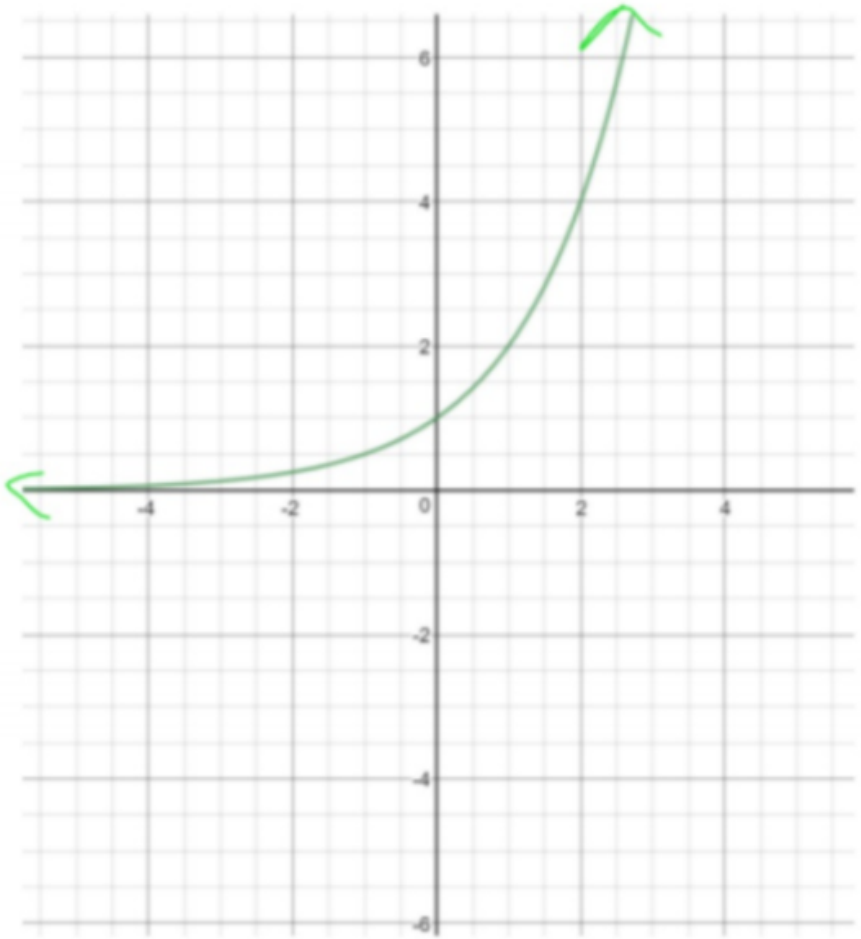

Warm-up

1. What is the parent graph?

2. What is the domain?

3. What is the range?

SWBAT find the inverse of an exponential and logarithmic equation.

Agenda:

- **Warm-up**
- **Review inverses**
- **Notes on exponentials and logs**
- **Practice**

Find the inverse of the functions:

1. $f(x) = 2x + 5$

2. $g(x) = 2(x + 3)^2 - 1$

Find the inverse of the functions:

1. $f(x) = 2x + 5$ $f^{-1}(x) = \frac{x-5}{2}$ $f^{-1}(x) = \frac{1}{2}x - \frac{5}{2}$

2. $g(x) = 2(x + 3)^2 - 1$

$g^{-1}(x) = -\sqrt{x+1} - 3$

$x \leq 0$

How do we solve for x algebraically?

$2^x = 10$

$\frac{}{2} \qquad \frac{}{2}$

$2^{x-1} = 5$

logarithms

what it =

$\log_2 10 = x$

exponent

base

$\log(10) / \log(2)$

.f2

Alpha Window #5 log· base

***Logarithms are the inverse operation of exponentials.

***Rewriting forms:

$\log_x z = y$ in exponential form is $x^y = z$

Base stays the base, the other two switch place.

Examples: Convert from log to exp form

1. $\log_2 8 = 3$

2. $\log_4 16 = 2$

Convert from exp to log form.

3. $3^5 = 243$

4. $2^x = 10$

Examples: Convert from log to exp form

1. $\log_2 8 = 3$ $2^3 = 8$

2. $\log_4 16 = 2$ $4^2 = 16$

Convert from exp to log form.

3. $3^5 = 243$ $\log_3 243 = 5$

4. $2^x = 10$ $\log_2 10 = x$

Notes: Finding inverses of exponential functions

1. switch x and y
2. isolate the exponential term
3. change from exponential form to log form
4. solve for y

$y = 4(3^{x+1})$

x^{-1} $\sqrt[2]{\ }$ $\log_{10}$

$\frac{x}{4} = \frac{4(3^{y+1})}{4}$

$\frac{x}{4} = 3^{y+1}$

$\log_3\left(\frac{x}{4}\right) = \log_3\left(3^{y+1}\right)$

$\log_3 \frac{x}{4} = y+1$

$-1 \qquad -1$

$\log_3\left(\frac{x}{4}\right) - 1 = y^{-1}$

Ex:

$$y = \left(\frac{5^x - 4}{3}\right)^2$$

$$x = \left(\frac{5^y - 4}{3}\right)^2$$

$$3 \cdot \sqrt{x} = \frac{5^y - 4}{3} \cdot 3$$

$$3\sqrt{x} = 5^y - 4$$

$$+4 \qquad +4$$

$$3\sqrt{x} + 4 = 5^y \rightarrow \log_5(5^y) = y$$

$$\log_5(3\sqrt{x} + 4) = y^{-1}$$

y^{-1} b/c its the inverse.

Finding the inverse of log functions:

$\log(x)^2 = 2\log x$

$y = \log(-5x)$

1. switch x and y

$x = \log_{10}(-5y)$ (10 understood)

2. isolate the log term

$\frac{10^x}{-5} = \frac{-5y}{-5}$

$10^{\log(-5y)} = -5y$

3. change to exponential form

$\frac{10^x}{-5} = y$

$-2 \cdot 10^{x-1} = y^{-1}$

$10^x = 10^1 \cdot 10^{x-1} = 10^{1+x-1} = 10^x$

4. solve for y

$$y = \log_3 (x + 4)$$

$x = \log_3 (y + 4)$

$3^x = y + 4$

$-4 \qquad -4$

$\boxed{3^x - 4 = y^{-1}}$

$3^{\log_3 (y+4)} = y + 4$

$$y = \log_5 (x - 1) + 2$$

$x = \log_5 (y-1) + 2$

$-2 \qquad -2$

$x - 2 = \log_5 (y-1)$

$5^{x-2} = y - 1$

$+1 \qquad +1$

$5^{x-2} + 1 = y$