Every math operation has it's inverse.

Inverse operations "undo" each other.

We solve equations by using inverses to get the variable by itself.

## Find the equation of the inverse for this function:

$$y = \sqrt{\frac{4x^3 - 7}{8}} + 1$$

$$\times = \sqrt{\frac{4y^3 - 7}{8}} + 1$$
Switch the x and y.

Then solve for y.

Given Operation	Inverse Operation
Addition	Subtraction
Division	Multiplication
Squaring	Square Root
Cube Root	Cubing

## Find the equation of the inverse.

$$y = 10^{x}$$

At this point you don't know how to do this!!!

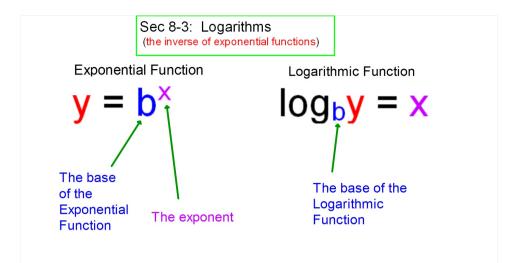
To solve for x in an exponential equation:  $y = 10^x$  we use the inverse operation called:

Logarithm

How do you say this?

$$Log_b y = x$$

Log base b of y equals x



**Exponential Function**:

$$y = b^{x}$$

Logarithmic Function:

"Log, base b, of y equals x"

$$log_b y = x$$

## Rewriting an equation into Logarithmic form.

**Exponential Function**:

Logarithmic Function:

Exponential Equation

Range:
y>0
Any real number

y = b

b>0, b**‡**1

Logarithmic Equation

$$log_b y = x$$

You can only input positive

numbers to

a logarithm and you can

get anything out of a logarithm.

Range: Domain:
Any real x > 0
number

b: b>0, b**#**1

Another way to remember how to write an Exponential Equation in Logarithmic Form:

Exponential Form:

$$x = y^z$$

becomes

Lograrithmic Form:

$$z = Log_y x$$

Get a small white board, marker, and rag.

1. Rewrite each into logarithmic form.

a. 
$$5^{x} = 40$$
  $\longrightarrow \log_{5} 40 = x$ 

b. 
$$6^2 = x$$
  $\longrightarrow$   $6^2 = x$ 

c. 
$$x^2 = 20$$
  $\longrightarrow$   $\log_x 20 = 2$ 

Write in Logarithmic Form:

$$10^{x} = 125$$

 $LOG_{10}125 \rightarrow "LOG base 10 of 125" \rightarrow LOG125$ 

LOG<sub>10</sub> is called the Common Logarithm and is written without the 10.

The button on the calculator LOG is for Common Logarithms LOG<sub>10</sub>

2. Write each in exponential form.

a) 
$$\log_x 169 = 2$$
 b)  $\log_8 x = 1$ 

$$x 169 = 2$$

$$\begin{array}{ccc}
\downarrow & & \downarrow \\
\times^{2}=169 & & \aleph=\times
\end{array}$$

b) 
$$Log_8 x =$$

$$Log_8 x =$$

c) 
$$Log_{4}^{3} = x$$

Evaluate each: (hint: think of each as an exponential)

$$4^{\times}=1 \Rightarrow x=0$$

3.  $\log_{7}(7)$ 

$$7^{\times} = 7 \rightarrow \times = 1$$

5.

$$4^{x}=1 \rightarrow x=0$$
  $3^{x}=9 \rightarrow x=2$ 

4. 
$$\log_{25}5 = \frac{1}{2}$$

$$25^{\times} = 5 \longrightarrow \sqrt{25} = 5$$

$$X = \frac{1}{2}$$