Every math operation has its inverse.

To solve equations we undo operations by using it's inverse.

To solve for x in an exponential equation: $y = 4^x$ we use the inverse operation called:

Logarithm

Logarithm:

$\log_2 8 = 3$

"Log base 2 of 8 equals 3"

Sec 8-3: Logarithms

(the inverse of exponential functions)

Exponential Function:

$y = b^x$

Logarithmic Function:

$\log_b y = x$

The base is the base

The exponent is the answer

Exponential Equation

Range: $y>0$

Domain: Any real number

$y = b^x$

$b>0, b\neq 1$

Logarithmic Equation

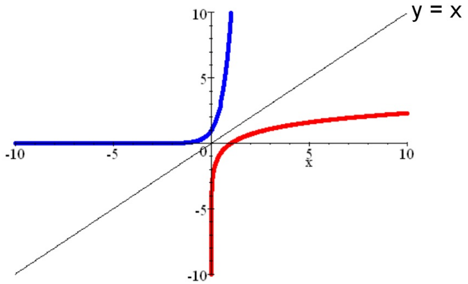
$\log_b x = y$

Range: Any real number

Domain: $x>0$

b: $b>0, b\neq 1$

the graphs of $y = 10^x$ and $y = \log_{10}x$



This shows that the graph of the logarithm is a reflection of the exponential function which is true of all inverse functions

Use the small white boards

Rewrite each into logarithmic form.

1. $5^x = 40$ $\log_5 40 = x$
2. $6^2 = x$ $\log_6 x = 2$
3. $x^2 = 20$ $\log_x 20 = 2$

Solve $10^x = 200$

Rewrite as a logarithm:

$10^x = 200 \longrightarrow \text{Log}_{10}200 = x$

Common Logarithm: Logarithm with base 10

Log_{10} is written as just Log

$\text{Log}_{10}200 = \text{Log}200 = 2.301$

The button on a calculator the has LOG is for a common logarithm.
Just press LOG and enter the # 200.

Use the small white boards

Write each in exponential form:

1. $\log_2 x = 3$ $2^3 = x$
2. $\log_x 49 = 2$ $x^2 = 49$
3. $\log 1000 = x$ $10^x = 1000$

Use the small white boards

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

1. $\log_4 1$ $= 0$ $\quad 4^x = 1$
2. $\log_3 9$ $= 2$ $\quad 3^x = 9$
3. $\log_7(7)$ $= 1$ $\quad 7^x = 7$
4. $\log_{25} 5$ $= \frac{1}{2}$ $\quad 25^x = 5$ $\quad \sqrt{25} = 5$
5. $\log_6(6^4)$ $= 4$ $\quad 6^x = 6^4$
6. $\log_2(0.5)$ $= -1$ $\quad 2^x = \frac{1}{2}$
7. $\log 54$ $= 1.73$

Just do this on the calculator

Solve for x.

$10^x = 525$

$\text{Log}_{10} 525 = x$

$\text{Log} 525 = x$

$2.72 = x$