Find the equation of the inverse.

$$y = 10^x$$

Right now you don't know how to solve exponential equations or write the inverse of exponential equations.

This will take a new function you've never seen before.

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

## Logarithm

The equation of the inverse of an Exponential Function

$y = b^x$ Switch x and y → $x = b^y$

Solve for y ↓

$\log_b x = y$

Sec 8-3: Logarithms
(the inverse of exponential functions)

Exponential Function

$y = b^x$

The base of the Exponential Function

The exponent

Logarithmic Function

$\log_b x = y$

The base of the Logarithmic Function

## Exponential Function

"y equals b to the power of x"

## Logarithmic Function

"y equals Log base b of x"

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

Switch x & y

The base is the base

The exponent becomes the answer

## Rewrite each into logarithmic form.

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

## Rewrite each into exponential form.

1. $\text{LOG}_5 8 = x$ → $5^x = 8$
2. $\text{LOG}_3 x = 12$ → $3^{12} = x$
3. $\text{LOG}_x 15 = 30$ → $x^{30} = 15$

## Exponential Equation

$y = b^x$

Range: $y > 0$

Domain: Any real number

$b > 0, b \neq 1$

## Logarithmic Equation

$\log_b x = y$

Range: Any real number

Domain: $x > 0$

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

Write in Logarithmic Form: $10^x = 125$

$\log_{10} 125 = x$

$LOG_{10}125$ → "LOG base 10 of 125" → LOG125 = 2.10

$LOG_{10}$ is called the Common Logarithm and is written without the 10.

The button on the calculator [LOG] is for Common Logarithms $LOG_{10}$

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

1. $\log_4 1 = 0$ ($4^x = 1$)
2. $\log_3 9 = 2$ ($3^x = 9$)
3. $\log_7(7) = 1$ ($7^x = 7$)
4. $\log_{25} 5 = \frac{1}{2}$ ($25^x = 5$, $\sqrt{25} = 5$, $x = \frac{1}{2}$)
5. $\log_6(6^4) = 4$ ($6^x = 6^4$)
6. $\log_2(0.5) = -1$ ($2^x = 0.5$, $2^x = \frac{1}{2}$, $x = -1$)
7. log54 = 1.73

You can now finish Hwk #34

Practice Sheet Sec 8-3

Due tomorrow

Solve each equation. Round to the nearest tenth.

1. $10^x = 1500$

Rewrite this as a Logarithmic EQ.

$\log_{10} 1500 = x$

$\log 1500 = x$

$x = 3.17$

2. $\frac{4(10)^x}{4} = \frac{570}{4}$ Rewrite this as a Logarithmic EQ.

$10^x = 142.5$

$\log_{10} 142.5 = x$

$\log 142.5 = x$

$x = 2.15$

Solve: $\log_2 x = 3$

Rewrite this as an Exponential EQ.

$2^3 = x$

$\boxed{8 = x}$