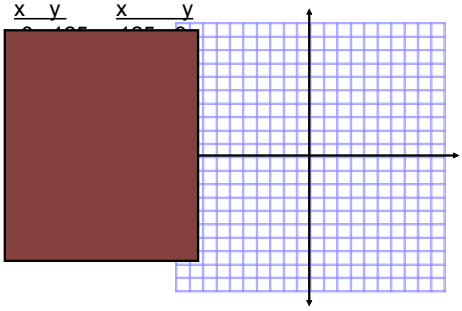
Aim: What is the inverse of the exponential function?

HW: Ch 8 Read Pages 319-326
pg # 5, 13 to 24, pg 326 # 2-6,15-18

Do Now: Graph the inverse of
$y = 2^x$

x y x y



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A logarithmic function is the inverse of an exponential function.

For the function $y = 2^x$, the inverse is $x = 2^y$

In order to solve this inverse equation for y, we write it in logarithmic form.

$x = 2^y$ is written as $y = \log_2 x$

and is read as "y = the logarithm of x to base 2".

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Comparing Exponential and Logarithmic Function Graphs

$y = 2^x$	$y = \log_2 x$
The y-intercept is 1.	There is no y-intercept.
There is no x-intercept.	The x-intercept is 1.
The domain is $\{x \mid x \in R\}$.	The domain is $\{x \mid x > 0\}$.
The range is $\{y \mid y > 0\}$.	The range is $\{y \mid y \in R\}$.
There is a horizontal asymptote at $y = 0$.	There is a vertical asympt at $x = 0$.

The graph of $y = 2^x$ has been reflected in the line of $y = x$, to give the graph of $y = \log_2 x$. This is because logarithmic functions are inverses of exponential functions

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Logarithms

Consider $7^2 = 49$.

2 is the exponent of the power, to which 7 is raised, to equal 4

The logarithm of 49 to the base 7 is equal to 2 ($\log_7 49 = 2$).

Exponential notation	Logarithmic form
$7^2 = 49$	$\log_7 49 = 2$

In general: If $b^x = N$, then $\log_b N = x$.

State in logarithmic form:

a) $6^3 = 216$ $\log_6 216 = 3$

b) $4^2 = 16$ $\log_4 16 = 2$

State in exponential form

a) $\log_5 125 = 3$ $5^3 = 12$

b) $\log_2 128 = 7$ $2^7 = 12$

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For $b > 0$ and $b \neq 0$

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

Write the inverse of each function:

1) $y = 2^x$ 2) $y = 6^x$

3) $y = 3^x$ 4) $y = \log_3 x$

5) $y = \log_7 x$

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Write in exponential form:

1.) $\log_5 125 = 3$

2.) $\log_7 49 = 2$

$\log_b C = a \leftrightarrow b^a = C$

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3) Write $8^2 = 64$ in log form.

4) Write $\log_3 81 = 4$ in exponential form.

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5) Solve for x: $\log_x 8 = 3$

6) Find the value of $\log_{25} 125$

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Practice:

Write in exponential form:

1) $\log_2 64$

2) $\log_4 32 = 5/2$

Write in logarithmic form:

3) $2^4 = 16$

4) $3^2 = 9$

Solve for x:

5) $\log_2 x = 4$

6) $\log_5 x = 2$

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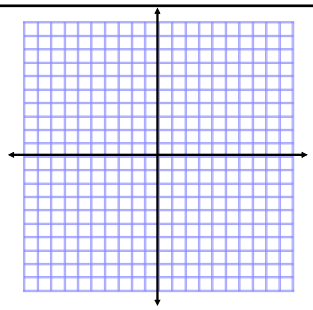

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Evaluating Logarithms

1. $\log_2 128$

$\log_2 128 = x$

$2^x = 128$

$2^x = 2^7$

$x = 7$

2. $\log_3 27$

$\log_3 27 = x$

$3^x = 27$

$3^x = 3^3$

$x = 3$

3. $\log_5 5^6 = 6$

$\log_a a^m = m$

4. $\log_8 16$

$\log_8 16 = x$

$8^x = 16$

$2^{3x} = 2^4$

$3x = 4$

$x = \frac{4}{3}$

5. $\log_8 1$

$\log_8 1 = x$

$8^x = 1$

$8^x = 8^0$

$x = 0$

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