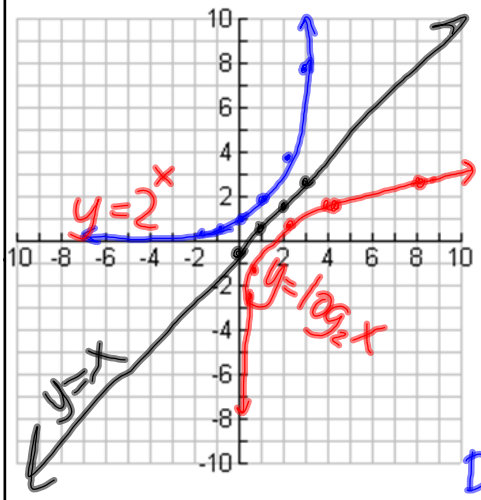
Introduction to Logs

Graph $y = 2^x$



$y = 2^x$

x	y
-2	$\frac{1}{4}$
-1	$\frac{1}{2}$
0	1
1	2
2	4
3	8

Domain: $\mathbb{R}$

Range: $\{y \mid y > 0\}$

INVERSE

$x = 2^y$

x	y
$\frac{1}{4}$	-2
$\frac{1}{2}$	-1
1	0
2	1
4	2
8	3

"Switch"

Domain: $\{x \mid x > 0\}$

Range: $\mathbb{R}$

A **Logarithm** is an **EXPONENT**—it is the exponent which the base must be raised to produce a given number.

$$x = 2^y$$

__y__ is the exponent to base __2__ needed to obtain __x__

OR

__y__ is the __logarithm__ to the base __2__ of __x__

OR

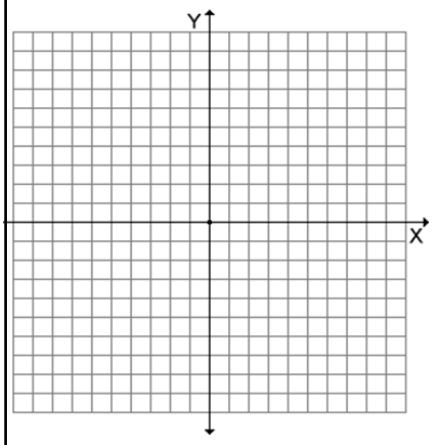
$y = \log_2 x$

$\therefore$ $x = 2^y$ $\Leftrightarrow$ $y = \log_2 x$ (equivalent to)

$y=2^x$

Point (x, y) x, y	Exponential Form $x=2^y$	Logarithmic Form $y=\log_2 x$	Logarithmic Form Is Read As
(8, 3)	$8=2^3$	$3=\log_2 8$	3 is exp of base 2 of 8
(4, 2)	$4=2^2$	$2=\log_2 4$	2 is exp 2 4
$(\frac{1}{2}, -1)$	$\frac{1}{2}=2^{-1}$	$-1=\log_2 \frac{1}{2}$	-1 exp 2 $\frac{1}{2}$
$(\frac{1}{4}, -2)$	$\frac{1}{4}=2^{-2}$	$-2=\log_2 \frac{1}{4}$	

a. Graph $y = 5^x$ on the interval $-2 \le x \le 2$
b. Sketch the inverse of $y = 5^x$
c. State the equation of the curve graphed in part c using some form of the word logarithm.



Logarithmic Form	Exponential Form
$\log_7 49 = 2$	$7^2 = 49$
$\log_{10} .1 = -1$	$10^{-1} = .1$
$\log_4 2 = \frac{1}{2}$	$4^{\frac{1}{2}} = 2$
$\log_9 27 = \frac{3}{2}$	$9^{\frac{3}{2}} = 27$
$\log_8 64 = 2$	$8^2 = 64$
$\log_3 81 = 4$	$3^4 = 81$

$2=\log_7 49$

$\frac{3}{2}=\log_9 27$

$\log_3 81 = 4$

$3^4 = 81$

Rewrite each equation in exponential form.

1) $\log_6 36 = 2$

2) $\log_{289} 17 = \frac{1}{2}$

3) $\log_{14} \frac{1}{196} = -2$

4) $\log_3 81 = 4$

Rewrite each equation in logarithmic form.

5) $64^{\frac{1}{2}} = 8$

6) $12^2 = 144$

7) $9^{-2} = \frac{1}{81}$

8) $\left(\frac{1}{12}\right)^2 = \frac{1}{144}$

Rewrite each equation in exponential form.

9) $\log_u \frac{15}{16} = v$

10) $\log_v u = 4$

11) $\log_{\frac{7}{4}} x = y$

12) $\log_2 v = u$

13) $\log_u v = -16$

14) $\log_y x = -8$

Rewrite each equation in logarithmic form.

15) $u^{-14} = v$

16) $8^b = a$

17) $\left(\frac{1}{5}\right)^x = y$

18) $6^y = x$

19) $9^y = x$

20) $b^a = 123$