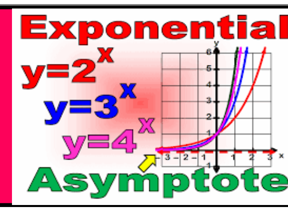
Unit 2

Exponents and Logarithms



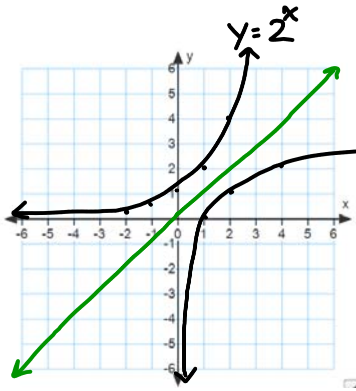
2.4 Logarithms

"log base 2 of x"

Logarithms are the inverse of exponential functions(switch x and y).

$y = 2^x$

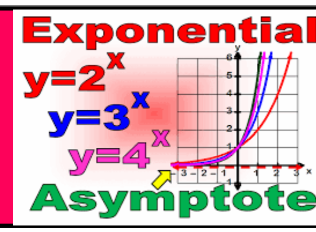
x	y
-2	1/4
-1	1/2
0	1
1	2
2	4



$f^{-1}(x) = \log_2 x$

(x, y)	$f^{-1}(x)$
(-2, 1/4)	(1/4, -2)
(-1, 1/2)	(1/2, -1)
(0, 1)	(1, 0)
(1, 2)	(2, 1)
(2, 4)	(4, 2)

$y = 2^x$ $y = \log_2 x$



Label the components of Logarithms and Exponents:

$\log_B A = E$ (base, arguement, result) $A = B^E$ (answer, base, exponent)

"The Seven Rule":

In order to write any logarithm in its corresponding exponential form, you can use the rule of seven to remember the form.

$\log_B A = E$ $B^E = A$

$\log_B A = E$ $\qquad\qquad$ $A = B^E$

Ex.) Change the follow from exponents to logs:

a) $2^x = 8$ $\quad \log_2 8 = x$

b) $a^3 = 27$ $\quad \log_a 27 = 3$

c) $4^x = 64$ $\quad \log_4 64 = x$

d) $3^x = 1/9$ $\quad \log_3 (1/9) = x$

e) $5^x = 100$ $\quad \log_5 100 = x = \frac{\log 100}{\log 5} = 2.861...$

(exact value vs. approximate value)

Ex.) Change the following logarithms to exponents:

a) $\log_2 8 = x$ $\quad 2^x = 8$

b) $\log_2 x = 10$ $\quad 2^{10} = x$

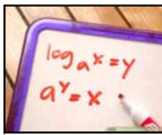
c) $\log_x y = z$ $\quad x^z = y$

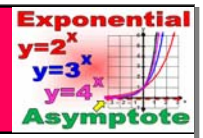
Calculating Logarithms on the calculator:

TI-NSpire calculators allow you to put any base in your calculator.

TI-84's always do a base of 10. If you need to calculate a log that has a base other than 10 you must do a "change of base."

ie. $\log_2 3 = \frac{\log(3)}{\log(2)} = 1.584...$



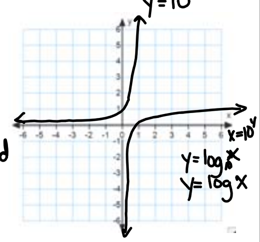


Ex.) Analyze logs of base ten:

y = 10^x ⟷ (switch x,y → inverse → logarithm) x = 10^y

x	y
-2	1/100
-1	1/10
0	1
1	10
2	100

x	y
100	2
10	1
1	0
-2	undefined



log 1000 = 3 $10^3 = 1000$

log 100 = 2

log 10 = 1

log 1 = 0

log (1/10) = -1

log (1/10 000) = -4

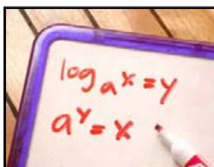
log$_{10}$ -10 = undefined.

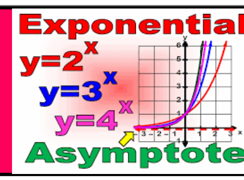
$10^x \neq -10$

NEVER a negative arguement.

When there is no base shown, the base is 10

You can **Never** take the log of a negative number!!!





Ex.) Solve.

a) $\log_2(1/8) = x$

$\frac{\log(1/8)}{\log 2} = -3$

$2^x = \frac{1}{8}$

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

$x = -3$

b) $\log_2 x = 5$

$2^5 = x$

$x = 32$

c) $x = \log_{10} 10000$

$10^x = 10000$

$10^x = 10^4$

$x = 4$

d) $\log_x 36 = 2$

$\sqrt{x^2} = \sqrt{36}$

$x = 6$

e) $\log_{64} x = 2/3$

$64^{2/3} = x$

$\sqrt[3]{64}^{\,2} = x$

$4^2 = x$

$16 = x$

Pg. 380 # 2-4, 12-14, 17, 18.