C12 - 8.0 - Laws of Logarithms Review

Math Alpha Math

Must have same base to use laws

$let\ m = logx$

$'b' is\ the\ base$

$'a'\ is\ "the\ thing\ you\ are\ logging"$

1. $\log_b a = c$ Log ⇄ $a = b^c$ Exponential — Change Forms

What power must you raise "b" to, to equal "a"? Slide "b" across.

$a > 0$
$b > 0, b \neq 1$ Restrictions

2. $log\ a^m = mloga$

The exponent of "a" can come down in front. Vice versa.

3. $\log_b a = \frac{loga}{log\ b}$

Change of base.

$\log_b a = \frac{\log_c a}{\log_c b}$:"c" is arbitrary

4. $log\ m + log\ n = log\ mn$

5. $log\ m - log\ n = log\ \frac{m}{n}$

Positives go on top, negatives go on bottom and vice versa.

Rule 3, 4 and 5 Must have coefficient of 1.

6. $\log_b a = \log_{b^n} a^n$

"a" and "b" can both be taken to the same exponent, $n \neq 0$

7. $b^{\log_b a} = a$

Same base of exponent as logarithm, answer is "a"

8. $\log_a a = 1$

9. $\log_a 1 = 0$

10. $logx = \log_{10} x$

Natural Logarithms: (same rules as logs)

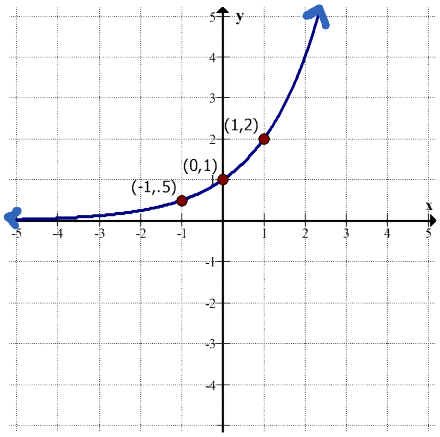
$ln\ e = 1$

$lnx = \log_e x$ $\ln x = \ln_e x$

Methods: "log" both sides
"de-log" both sides
"inverse": switch x and y
Set Log arbitrarily $= x$
Turn a number into a Log

Methods: "ln" both sides.
"de-ln" both sides.

$f(x) = 2^x$ $y = 2^x$

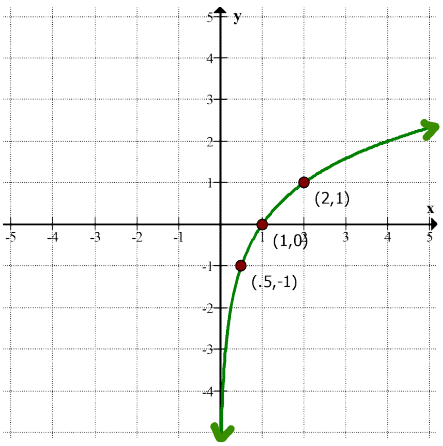


x	y
-1	$\frac{1}{2}$
0	1
1	2

Domain: $x \epsilon R$
Range: $y > k\ \ (a > 0)$
$y < k\ \ (a < 0)$
$HA: y = k$

$y = a(C)^{b(x-h)} + k$

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



x	y
$\frac{1}{2}$	-1
1	0
2	1

Domain: $b(x-h) > 0$
Range: $y \epsilon R$
$VA:\ b(x-h) = 0$

$y = alog\big(b(x-h)\big) + k$

Graphing:
Graph b^x
Switch x and y
Transformations

$\&\ base > 0, base \neq 1$