8-4 Logarithms

std. 11.0

The logarithm of y with base b is $\log_b y$ ("log base b of y") where $b > 0$, $b \neq 1$, and $y > 0$.

log form $\log_b y = x$ if and only if $b^x = y$ exponential form

ex. 1 Write $\log_5 625 = 4$ in exponential form.

$5^4 = 625$

$\log_b y = x$ if and only if $b^x = y$

ex. 2 Evaluate without a calculator:

a) $\log_2 \left(\frac{1}{8}\right) = x = -3$

$2^x = \frac{1}{8} = 2^3 = 2^{-3}$

b) $\log_{81} 27 = x$ $\quad 3/4$

$81^x = 27$

$(3^4)^x = 3^3$

$4x = 3$

ex. 3 Evaluate a) $\log 48 = \log_{10} 48 \approx 1.6812$

$10^{3.6812} \approx 4800$

b) $\log 4800 = 3.6812$

10^x

ex. 4 Evaluate $\ln 7$ natural log ≈ 1.9459

$\log_e 7$

$e^{1.9459} \approx 7$

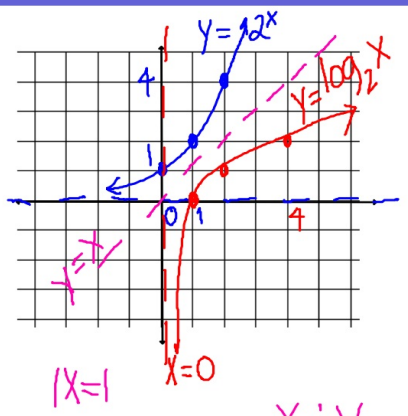
ex. 5 graph $y = 2^x$ and $y = \log_2 x$

x	y
0	1
1	2
2	4

$\log_2 x = y$

$2^y = x$

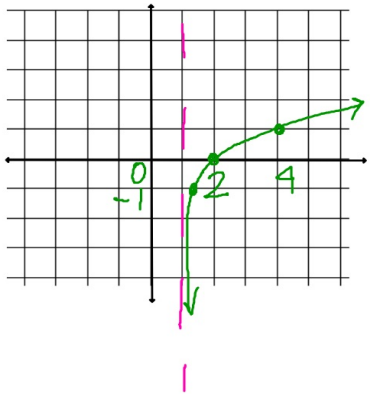
x	y
1	0
2	1
4	2



ex. 6 graph $y = \log_3 (x-1)$

$3^y = x-1$

$3^y + 1 = x$



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

$\frac{1}{3}+1$

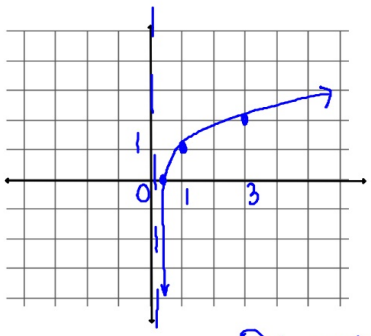
ex. 7 graph $y = \ln x + 1$

$y = \log_e x + 1$

$\log_e x = y-1$ $\quad y-1 = \log_e x$

$e^{y-1} = x$

x	y
$\approx .4$	0
1	1
≈ 2.7	2



D: $x > 0$

R: all real #s