Logarithm: inverse of exponential function

$y = \log_b x \leftarrow$ value

$\uparrow$ exponent $\quad \uparrow$ base

value $\neq$ $-$# or 0

* Evaluating Log: solving for the exponent

$\log_4 16$

* Evaluate:

$\log_4 x = 2 \qquad 4^2 = \boxed{16}$

$\log x = 3$

Common Log = log $\Longleftrightarrow$ $\log_{10}$

~~under stood~~ to be log base 10

Evaluate: $\log x = 3$

$\underbrace{\text{antilog } \log}_{\text{cancel}} x = \underline{\text{antilog } 3}$

$x = 10^3$

$x = 1{,}000$

antilog means 10^x

Eval antilog $\Longleftrightarrow$ solving for value

Reason for common log.

$\log_2 32 = x \qquad 2^x = 32$

$2^x = 2^5 \qquad x = 5$

$\log_2 15 = x \qquad 2^x = 15$

$\log 2^x = \log 15$ take log of both sides

change of base

$\log_b x = \dfrac{\log x}{\log b}$

$\dfrac{x \log 2}{\log 2} = \dfrac{\log 15}{\log 2}$

$x = 3.91$

ex: $\log 4^{x} = \log 21$

$$\frac{x \log 4}{\log 4} = \frac{\log 21}{\log 4}$$

$$x \approx 2.2$$

ex: $\log 2^{x-1} = \log 20$

$$\frac{(x-1)\log 2}{\log 2} = \frac{\log 20}{\log 2}$$

$$x-1 = 4.32$$

$$+1 \quad +1$$

$$x \approx 5.32$$

ex: $\log 3^{x-4} = \log 5^{x}$

$$\frac{(x-4)\log 3}{\log 3} = \frac{x \log 5}{\log 3}$$

$$x-4 = 1.46x$$

$$-x \quad -x$$

$$\frac{-4}{.46} = \frac{.46x}{.46}$$

$$-8.7 \approx x$$

* $\log(\# > 0) = +\#$

* $\log(\# < 0) = -\#$

ex: $.4^{x-1} < 3^{2x}$

$$\frac{(x-1)\log .4}{\log .4} < \frac{2x \log 3}{\log .4} \leftarrow -\#$$

$$x-1 > 2x(-1.2)$$

$$x-1 > -2.4x$$

$$-x \quad -x$$

$$\frac{-1}{-3.4} > \frac{-3.4x}{-3.4}$$

$.29 < x$ or $x > .29$