

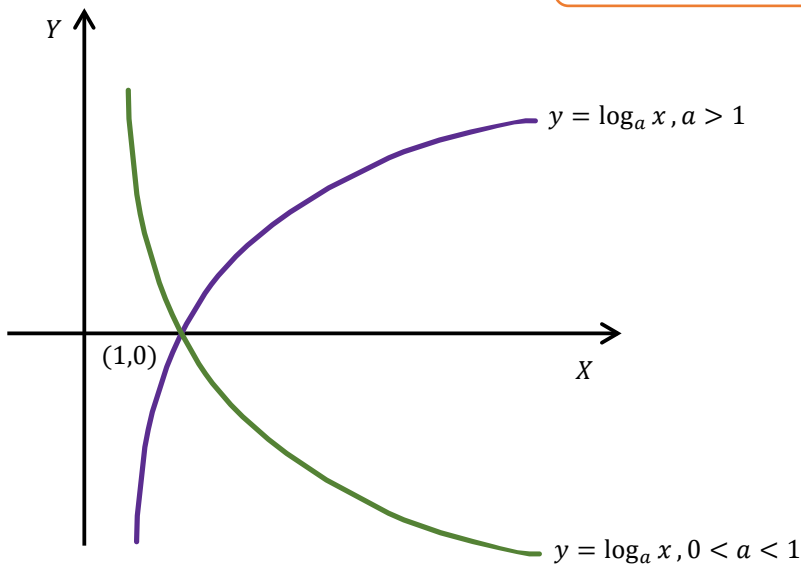
Logarithms

Anti-Logarithm

$$x = a^y \mid a, x > 0, a \neq 1$$

Logarithm

$$y = \log_a x \mid a, x > 0, a \neq 1$$



A rough Graph of the logarithmic function

Domains for Specific Cases:

$$y = \log_a x$$

$$x > 1$$

$$0 < x < 1$$

$$a > 1$$

$$y > 0$$

$$0 < y < 1$$

$$0 < a < 1$$

$$0 < y < 1$$

$$y > 0$$

Properties:

- 1) $a^{\log_a m} = m$
- 2) $\log_a x^n = n \log_a x$
- 3) $\log_{a^m} x = \frac{1}{m} \log_a x$
- 4) $\log_a m = \frac{1}{\log_m a}$
- 5) $\frac{\log_a b}{\log_a c} = \log_c b$
- 6) $\log_a x_1 + \log_a x_2 + \dots + \log_a x_n$
 $= \log_a (x_1 \cdot x_2 \cdot \dots \cdot x_n)$
- 7) $\log_a x_1 - \log_a x_2 = \log_a \frac{x_1}{x_2}$
- 8) $a^{\log_b c} = c^{\log_b a}$

Some common solving methods:

- 1) Solution Based on Basic Definition
- 2) Solving using Addition/Subtraction Property (#6&7) by bringing all terms to a common base
- 3) Solving by taking logarithm on both sides
- 4) Introducing change in base using property #5

NOTES:

Take care of the Domain of Logarithm.

Taking anti-log reverses the inequality if base of logarithm is less than 1.

Common Logarithm: $\log a = \log_{10} a$

Natural Logarithm: $\ln a = \log_e a$

$$\log 2 = 0.3010$$

$$\log 11 = 1.0414$$

$$\log 3 = 0.4771$$

$$\log 13 = 1.1139$$

$$\log 5 = 0.6989$$

[Video on How to use a Log Table](#)

$$\log 7 = 0.8450$$