

11.4 Logarithmic Functions

$$y = \log_2 16 \leftrightarrow 2^y = 16$$

base

$$2^y = 16, y = 4. \text{ Thus } \log_2 16 = 4$$

$$\text{Ex } \log_{27} 3 = \frac{1}{3} \Leftrightarrow 27^{\frac{1}{3}} = 3$$

$$\log_{16} 4 = \frac{1}{2} \Leftrightarrow 16^{\frac{1}{2}} = 4$$

Properties of logarithms

Product $\log_b mn = \log_b m + \log_b n$

Quotient $\log_b \frac{m}{n} = \log_b m - \log_b n$

Power $\log_b m^p = p \log_b m$

Equality IF $\log_b m = \log_b n$
 $m = n$

$$\log_{10}(2x+5) = \log_{10}(5x-4)$$

$$2x+5 = 5x-4$$

$$-1x + 4 - 2x + 4$$

$$\frac{9-3x}{3} \quad (x=3)$$

$$\text{Ex } \log_3(4x+5) - \log_3(3-2x) = 2$$

$$\log_3 \frac{4x+5}{3-2x} = 2$$

$$3^2 = \frac{4x+5}{3-2x}$$

$$9 \times \frac{4x+5}{3-2x}$$

$$4x+5 = 27 - 18x$$

$$+18x-5 \quad -5 \quad +18x$$

$$\frac{22x=22}{22}$$

$$(x=1)$$