

Lesson 118: Logarithmic Equations

Goal:
$$\boxed{\begin{array}{l} \log_b X = \log_b Y \\ X = Y \end{array}}$$

$$x \cdot x^p = x^{p+1}$$

Three important rules (Write these down)

1. $\log_b P + \log_b Q = \log_b PQ$

2. $\log_b P - \log_b Q = \log_b \frac{P}{Q}$

3. $X \log_b P = \log_b P^X$

Ex. 1) $\log_3 (x+7) + \log_3 2 = \log_3 20$

$$\log_3 [2(x+7)] = \log_3 20$$

$$2(x+7) = 20$$

$$2x + 14 = 20$$

$$\rightarrow 2x = 6$$

$$x = 3$$

Ex. 2) $\log_{14} (x+3) - \log_{14} (x-3) = \log_{14} 7$

$$\log_{14} \frac{x+3}{x-3} = \log_{14} 7$$

$$\frac{x+3}{x-3} = 7$$

$$\rightarrow x+3 = 7x-21$$

$$24 = 6x$$

$$x = 4$$

Ex. 3) $3 \log_5 X = \log_5 64$

$$\log_5 X^3 = \log_5 64$$

$$\sqrt[3]{X^3} = \sqrt[3]{64}$$

$$x = 4$$