

1/24/13 Solving log equations

$$\begin{aligned} \textcircled{1} \quad & 2\log(6x) - \log(3x) = \log(36) \\ & \log(6x)^2 - \log(3x) = \log(36) \\ & \log(36x^2) - \log(3x) = \log(36) \\ & \log\left(\frac{36x^2}{3x}\right) = \log(36) \end{aligned}$$

$$\log(12x) = \log(36)$$

$$\begin{array}{rcl} 12x & = & 36 \\ \hline 12 & & 12 \\ \boxed{x = 3} & & \end{array}$$

$$\begin{aligned} \textcircled{2} \quad & \underbrace{\log(2) + \log(x+5)}_{\log(2(x+5))} - \log(2) = \log(36) \\ & \log(2(x+5)) - \log(2) = \log(36) \\ & \log(2x+10) - \log(2) = \log(36) \\ & \log\left(\frac{2x+10}{2}\right) = \log(36) \\ & \frac{2x+10}{2} = 36 \\ & \frac{2x}{2} + \frac{10}{2} = 36 \\ & x + 5 = 36 \\ & \quad -5 \quad -5 \\ & \boxed{x = 31} \end{aligned}$$

$$\textcircled{3} \quad \log(x+2) - \log(2) = \log(24)$$

$$\log\left(\frac{x+2}{2}\right) = \log(24)$$

$$\cancel{x}\left(\frac{x+2}{2}\right) = (24)^2$$

$$\begin{array}{rcl} x+2 & = & 48 \\ -2 & & -2 \\ \boxed{x = 46} & & \end{array}$$

$$\textcircled{4} \quad \log_2(x) + \log_2(x) = -3$$

$$\log_2(x \cdot x) = -3$$

$$\cancel{\log_2(x^2)} = -3$$

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

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

$$\boxed{x = \frac{1}{2^{\frac{3}{2}}}}$$