

## 8.4: Solve Logarithmic Equations with Properties

Ex 1) Solve:  $\log_6 3x + \log_6 4x = 1$

$$\log_6 3x \cdot 4x = 1$$

$$\log_6 12x^2 = 1$$

$$6^1 = 12x^2$$

$$\pm \sqrt{\frac{6}{12}} = \pm \sqrt{x^2}$$

$$\pm 0.707 = x$$

$$\boxed{x = 0.707}$$

\* Quantities inside a logarithm must be greater than 0!

Ex 2)  $\ln(x+5) - \ln 4 = 3$

$$\ln \frac{x+5}{4} = 3$$

$$4 \cdot e^3 = \frac{x+5}{4} \cdot 4$$

$$4e^3 = x + 5$$

$$4e^3 - 5 = x$$

$$\boxed{x = 75.342}$$

$$\text{Ex 3) } \log_2 X + \log_2 (X-2) = 3$$

$$\log_2 X(X-2) = 3$$

$$\log_2 (X^2 - 2X) = 3$$

$$2^3 = X^2 - 2X$$

$$8 = X^2 - 2X$$

$$0 = X^2 - 2X - 8$$

← factor or quadratic eqn

$$0 = (X-4)(X+2)$$

$$0 = X - 4$$

$$0 = X + 2$$

$$\boxed{X=4}$$

$$\cancel{X=-2}$$

# Solve exponential equations with binomial exponents

Ex 4) Solve  $3^{2x-7} = 11$

$$\log_3 11 = 2x - 7$$

$$2 \cdot 18 \dots = 2x - 7$$

$$+ 7$$

$$\frac{9 \cdot 18 \dots}{2} = \frac{2x}{2}$$

$$x = 4.591$$

\* Graph in y1, y2

2<sup>nd</sup> → trace → 5

→ Enter 3x

Ex 5)

$$8^{x+9} = 12^{3x-4}$$

$$(x+9) \ln 8 = (3x-4) \ln 12$$

$$x \ln 8 + 9 \ln 8 = 3x \ln 12 - 4 \ln 12$$

$$x \ln 8 - 3x \ln 12 = -4 \ln 12 - 9 \ln 8$$

$$x \frac{\ln 8 - 3 \ln 12}{\ln 8 - 3 \ln 12} = \frac{-4 \ln 12 - 9 \ln 8}{\ln 8 - 3 \ln 12}$$

$$x = 5.331$$