

Name: _____

Date: _____

Learning Goal 8.1Solving exponential and logarithmic equations with same base and with different bases, including base e .**More Questions - Solutions**

Power Law	Product Law	Quotient Law	Change of Base
$\log_b x^y = y \log_b x$	$\log_b(xy) = \log_b x + \log_b y$	$\log_b\left(\frac{x}{y}\right) = \log_b x - \log_b y$	$\log_b x = \frac{\log_a x}{\log_a b}$

1. Solve for x . State any restrictions on the variable and verify your answers.

a. $\log_7 x + \log_7 4 = \log_7 12$

NPVs:

$x > 0$

$\log_7 x = \log_7 12 - \log_7 4$

$3 > 0 \quad \checkmark$

$\log_7 x = \log_7\left(\frac{12}{4}\right)$

$\log_7(3) + \log_7 4 = \log_7 12$

$\log_7 x = \log_7(3)$

$\log_7(3 \times 4) = \log_7 12$

$7^{\log_7 x} = 7^{\log_7(3)}$

$\log_7(12) = \log_7 12 \quad \checkmark$

$x = 3$

b. $\log_2(x - 6) = 3 - \log_2(x - 4)$

NPVs:

$x - 6 > 0$

$x - 4 > 0$

$x > 6$

$x > 4$

$\log_2(x - 6) + \log_2(x - 4) = 3$

$2 < 6$

Extraneous Root

$8 > 6 \quad \checkmark$

$\log_2((x - 6)(x - 4)) = 3$

$\log_2(x^2 - 10x + 24) = 3$

$2^{\log_2(x^2 - 10x + 24)} = 2^3$

$x^2 - 10x + 24 = 8$

$x^2 - 10x + 16 = 0$

$(x - 2)(x - 8) = 0$

$x = 2, 8$

$\log_2((8) - 6) = 3 - \log_2((8) - 4)$

$\log_2(2) = 3 - \log_2(4)$

$1 = 3 - 2$

$1 = 1 \quad \checkmark$

c. $\log_3(x^2 - 8x)^5 = 10$

$$5 \log_3(x^2 - 8x) = 10$$

$$\log_3(x^2 - 8x) = 2$$

$$3^{\log_3(x^2 - 8x)} = 3^2$$

$$x^2 - 8x = 9$$

$$x^2 - 8x - 9 = 0$$

$$(x - 9)(x + 1) = 0$$

$$x = -1, 9$$

NPVs:

$$x^2 - 8x > 0$$

$$x(x - 8) > 0$$

$$x > 0$$

$$x > 8$$

$$-1 < 8$$

Extraneous Root

$$9 > 8 \quad \checkmark$$

$$\log_3((9)^2 - 8(9))^5 = 10$$

$$\log_3(81 - 72)^5 = 10$$

$$\log_3(9)^5 = 10$$

$$\log_3(3)^{10} = 10$$

$$10 = 10 \quad \checkmark$$

d. $\log_2(x + 3)^2 = 4$

$$2 \log_2(x + 3) = 4$$

$$\log_2(x + 3) = 2$$

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

$$x + 3 = 4$$

$$x = 1$$

NPVs:

$$x + 3 > 0$$

$$x > -3$$

$$1 > -3 \quad \checkmark$$

$$\log_2((1) + 3)^2 = 4$$

$$\log_2(4)^2 = 4$$

$$\log_2(2)^4 = 4$$

$$4 = 4 \quad \checkmark$$