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Date _____
Pre Calculus

Logarithm Equations with Logs on Both Sides

Solve each equation

1. $\log_3 3x = \log_3 15$

$$\frac{3x}{3} = \frac{15}{3}$$

$$x = 5$$

3. $2\log_4 x = \log_4 25$

$$\log_4 x^2 = \log_4 25$$

$$\sqrt{x^2} = \sqrt{25}$$

$$x = 5$$

2. $\ln(4x-1) = \ln(2x+3)$

$$4x-1 = 2x+3$$

$$-2x \quad -2x$$

$$2x-1 = 3$$

$$+1 \quad +1$$

$$\frac{2x}{2} = \frac{4}{2}$$

4. $\frac{1}{2}\log_7 x = \log_7 3$

$$\log_7 x^{\frac{1}{2}} = \log_7 3$$

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

$$x = 9$$

5. $\log 2 + \log(x+5) = \log 40$

$$\log 2(x+5) = \log 40$$

$$2(x+5) = 40$$

$$2x+10 = 40$$

$$-10 \quad -10$$

$$\frac{2x}{2} = \frac{30}{2}$$

$$x = 15$$

6. $\log(x-6) - \log(3) = \log 6$

$$\log \frac{x-6}{3} = \log 6$$

$$\frac{x-6}{3} = 6$$

$$x-6 = 18$$

$$+6 \quad +6$$

$$x = 24$$

7. $\log x + \log(x-3) = \log 18$

$$\log x(x-3) = \log 18$$

$$x(x-3) = 18$$

$$x^2 - 3x = 18$$

$$-18 \quad -18$$

$$x^2 - 3x - 18 = 0$$

$$(x-6)(x+3) = 0$$

$$x=6 \quad x=-3$$

9. $\log_3 2 + 2\log_3 x = \log_3(7x-3)$

$$\log_3 2x^2 = \log_3(7x-3)$$

$$2x^2 = 7x - 3$$

$$-7x + 3 \quad -7x + 3$$

$$2x^2 - 7x + 3 = 0$$

$$\begin{array}{r} (2x^2 - 6x) \quad (-1x + 3) \\ 2x \quad 2x \quad -1 \quad -1 \end{array}$$

$$2x(x-3) - 1(x-3)$$

$$(2x-1)(x-3) = 0$$

$$2x-1=0 \quad x-3=0$$

$$\frac{2x}{2} = \frac{1}{2}$$

$$x=3$$

$$x = \frac{1}{2}$$

8. $\log_2 x + \log_2(x-6) = \log_2 16$

$$\log_2 x(x-6) = \log_2 16$$

$$x(x-6) = 16$$

$$x^2 - 6x = 16$$

$$-16 \quad -16$$

$$x^2 - 6x - 16 = 0$$

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

$$x=8 \quad x=-2$$

10. $\log_8(x-40) - \log_8(x-10) = \log_8(x+2)$

$$\log_8 \frac{x-40}{x-10} = \log_8(x+2)$$

$$\frac{x-40}{x-10} = (x+2)(x-10)$$

$$x-40 = x^2 - 10x + 2x - 20$$

$$x-40 = x^2 - 8x - 20$$

$$-x+40 \quad -x+40$$

$$0 = x^2 - 9x + 20$$

$$0 = (x-5)(x-4)$$

$$x=5 \quad x=4$$

No solution