8-4 Solving Logarithmic Equations

Property of Equality: If $\log_b m = \log_b n$, then m = nwhere b, m, & n > 0 and $b \ne 1$

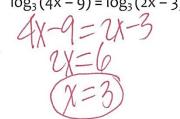
Use this when you can set one logarithm equal to another logarithm and the bases are the same.

STEPS TO SOLVE USING THE PROPERTY OF EQUALITY:

- 1. Rewrite the equation so there is one logarithm on each side.
- 2. Set the "numbers" equal to each other.
- 3. Solve the "simple equation".
- 4. Check the solution by substituting the value into the *original* equation!

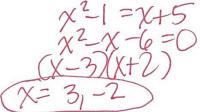
Solve each logarithmic equation. Round to three decimal places when necessary.

1. $\log_3(4x-9) = \log_3(2x-3)$



- $\log_4(3x-1) \log_4(2x+3) = 0$ $\log_4(3x-1) \log_4(2x+3) = 0$ 3x 1 = 2x + 3 x = 4
- 5. $\log_2(x^2-6) = \log_2(2x+2)$ $\chi^2 - (y = 1) + 2$ $\chi^2 - 1x - 8 = 0$ $\chi - 4$ (x+2) = 0 $\chi - 4$ (x+2) = 0
- 7. $\log_9(3-x) = \log_9(5x-15)$ 3-x=5x-15 18=6xx=3

2. $\log(x^2 - 1) = \log(x + 5)$

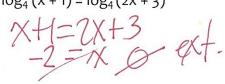


4. $\log x = \log (5x - 10)$

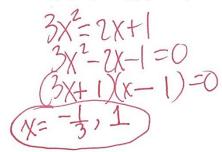
$$X = 5X - 10$$

 $-4X = -10$
 $X = 2.5$

6. $\log_4(x+1) = \log_4(2x+3)$



8. $\log_5(3x^2) = \log_5(2x + 1)$



Converting from Exponential to Logarithmic Form: If $n = b^p$, then $p = \log_b n$ where b & n > 0 and $b \ne 1$

Use this method when there is only ONE logarithm in the equation.

STEPS TO SOLVE BY CONVERTING THE FORM:

- 1. Isolate the logarithm.
- 2. Rewrite the equation in exponential form.
- 3. Solve the "simple equation".
- 4. Check the solution by substituting the value into the original equation!

Watch this video to help do these 4 problems: http://www.youtube.com/watch?v=NjF8XdaC9sM

1.
$$\log_4 64 = x$$

$$2. \log_2\left(\frac{1}{16}\right) = x$$

3.
$$\log_5 x = 3$$

4.
$$\log_{x} 81 = 4$$

Solve each logarithmic equation. Round to three decimal places when necessary.

5.
$$7\log x = 21$$

6.
$$\log_2 x = 1.5$$

7.
$$2 + \log_2 3x = 8$$

10g23X=6

8.
$$\log(2x+1)+4=5$$

9.
$$\log_3 2x = -2$$

10.
$$\log_8(x-5) = \frac{2}{3}$$

11.
$$\log_x (5x) = 2$$

12.

 $\log_2 32 = 3x$

$$3x=5$$
 $x=5=1.6$