

**Solving Equations Involving Logarithms Class Work**

Objective: You will be able to solve equations involving logarithms.

★ **Property of Equality**

Property of Equality: In general, if  $\log_a x = \log_a y$ , then  $x = y$ !

Example 1: Solve for x.

$$\log_{13}(2x - 5) = \log_{13}(3x + 1)$$

$$2x - 5 = 3x + 1$$

$$x = -6$$

Check:

$$\log_{13}(2(-6) - 5)$$

$$\log_{13}(-17)$$

\*no neg. argument

$x = -6$  is extraneous

\*Something interesting happens with this solution...what do you think?!

Example 2: Solve for x.

$$\log_3(3x) - \log_3 12 = \log_3(x - 2)$$

$$\log_3\left(\frac{3x}{12}\right) = \log_3(x - 2)$$

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

$$4x - 8 = x - 2$$

$$3x = 8 \Rightarrow x = \frac{8}{3}$$

\*Strategy:

- Condense
- Set arguments
- Check

Practice: Solve for the variable in each equation. Remember to check that your solutions are valid.

1.  $\log_5(3z + 1) = \log_5(6z - 8)$

$$z = 3$$

2.  $\log_2(4w) - \log_2 8 = \log_2(6w - 1)$

$$w = \frac{2}{11}$$

③  $y = \pm 2$

④  $x = 4$   
 $x = -1$  extraneous

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

10.  $\ln(2x - 3)^2 = 8$

**For Fun!**

- Create a logarithmic equation in which the solution is  $x = e^5 - 3$ .
- Create a logarithmic equation that can be solved using the equation  $3x^3 + 12x - 8 = 0$
- Create a logarithmic equation that has no real solution.
- Create a logarithmic equation that can be solved using the equation  $3^{10} = \frac{2x-5}{3x}$ .

\*Be sure to explain your reasoning for each! ☺ Have fun!

Exit Slip Problems:

- Solve for x. Be sure to identify whether each solution is valid or extraneous.
  - $\ln(3x) + \ln(2x - 6) = \ln(60)$
  - $\log_2(4) + \log_2(3x+1) = \log_2(20)$
- Write the quadratic equation that could be used to solve  $\log_3(2m) + \log_3(m + 6) = 3$
- Solve for n:  $\log_3(5x) + \log_3(8) = \log_3(2x - 1)$
  - Solve for w:  $\ln(4w + 3) = 2$

Homework:

Part 1: Solve for the variable in these 5 problems.

- $\log_3(2z - 9) = \log_3(4z + 9)$
- $\log_2(8w) - \log_2 7 = \log_2(2w - 5)$
- $\log_6(x^2 - 10) = \log_6(15)$
- $\ln(3x) + \ln(x - 7) = \ln 3$
- $\log_{15}(2c) + \log_{15}(c - 8) = \log_{15} 10$

Part 2: pages 456-459 # 33-47 odd, 101, and 103

Part 3: page 465 #14-19

Throwback: page 460 #116-124 and 127