NAME _____ DATE _____ PERIOD _____

7-4 Study Guide and Intervention

Solving Logarithmic Equations and Inequalities

Solving Logarithmic Equations

Property of Equality for Logarithmic Functions	If b is a positive number other than 1, then $\log_b x = \log_b y$ if and only if $x = y$.

Example 1 **Solve $\log_2 2x = 3$.**

$\log_2 2x = 3$ Original equation

$2x = 2^3$ Definition of logarithm

$2x = 8$ Simplify.

$x = 4$ Simplify.

The solution is $x = 4$.

Example 2 **Solve the equation $\log_2 (x + 17) = \log_2 (3x + 23)$.**

Since the bases of the logarithms are equal, $(x + 17)$ must equal $(3x + 23)$.

$(x + 17) = (3x + 23)$

$-6 = 2x$

$x = -3$

Exercises

Solve each equation.

1. $\log_2 32 = 3x$

$\frac{5}{3}$

2. $\log_3 2c = -2$

$\frac{1}{18}$

3. $\log_{2x} 16 = -2$

$\frac{1}{8}$

4. $\log_{25} \left(\frac{x}{2}\right) = \frac{1}{2}$

10

5. $\log_4 (5x + 1) = 2$

3

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

9

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

4

8. $\log_2 (x^2 - 6) = \log_2 (2x + 2)$

4

9. $\log_{x+4} 27 = 3$

-1

10. $\log_2 (x + 3) = 4$

13

11. $\log_x 1000 = 3$

10

12. $\log_8 (4x + 4) = 2$

15

13. $\log_2 x = \log_2 12$

$x = 12$

14. $\log_3 (x - 5) = \log_3 13$

$x = 18$

15. $\log_{10} x = \log_{10} (5x - 20)$

$x = 5$

16. $\log_5 x = \log_5 (2x - 1)$

$x = 1$

17. $\log_4 (x + 12) = \log_4 4x$

$x = 4$

18. $\log_6 (x - 3) = \log_6 2x$

no solution