Name Solutions

Period

Algebra 1
Worksheet #8
Solving Exponential Equations

Solve the following equations algebraically using the *one-to-one property*.

1.
$8^{2x} = 8^{x+7}$

$2x = x+7 \quad x = 7$

2.
$8^{x+3} = 2^{3x}$

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

$2^{3x+9} = 2^{3x}$

$3x+9 = 3x$

$9 = 0$

no solution

3.
$9^{2x} = 3^{2x+4}$

$(3^2)^{2x} = 3^{2x+4}$

$3^{4x} = 3^{2x+4}$

$4x = 2x+4$

$2x = 4$

$x = 2$

4.
$8^{x-1} = \left(\frac{1}{2}\right)^{2x-1}$

$(2^3)^{x-1} = (2^{-1})^{2x-1}$

$2^{3x-3} = 2^{-2x+1}$

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

$5x = 4$

$x = 4/5$

5.
$3^{-3x+1} = 3^{x-9}$

$-3x+1 = x-9$

$1 = 4x-9$

$10 = 4x$

$10/4 = x$

$x = 5/2$

6.
$\frac{1}{16}^{2x} = 8^{x-3}$

$(16^{-1})^{2x} = 8^{x-3}$

$(2^{-4})^{2x} = (2^3)^{x-3}$

$2^{-8x} = 2^{3x-9}$

$-8x = 3x-9$

$-11x = -9$

$x = 9/11$

7.
$4^{x+10} = 2^{4+x}$

$(2^2)^{x+10} = 2^{4+x}$

$2^{2x+20} = 2^{4+x}$

$2x+20 = 4+x$

$x = -16$

8.
$\left(\frac{1}{2}\right)^3 = \left(\frac{1}{4}\right)^{2x+1}$

$2^{-3} = (2^{-2})^{2x+1}$

$2^{-3} = 2^{-4x-2}$

$-3 = -4x-2$

$-1 = -4x$

$1/4 = x$

9.
$5^{x+6} = 125^{3x-2}$

$5^{x+6} = (5^3)^{3x-2}$

$5^{x+6} = 5^{9x-6}$

$x+6 = 9x-6$

$12 = 8x$

$\frac{12}{8} = x$

$x = \frac{3}{2}$

10.
$5^{x+6} = \left(\frac{1}{125}\right)^{3x-2}$

$5^{x+6} = (5^{-3})^{3x-2}$

$5^{x+6} = 5^{-9x+6}$

$x+6 = -9x+6$

$10x = 0$

$x = 0$

Solve the following equations using the graphing calculator.

11.
$5^x = 12$

$x \approx 1.54$

12.
$2^{x+3} = 7$

$x \approx -.19$

13.
$e^{-(x+2)} = 8$

$x \approx -4.08$

14.
$3 \cdot (1 + .05)^x = 10$

$x \approx 24.68$

15. Solve the system of equations using the graphing calculator.

$f(x) = -x^2 + 8$
$g(x) = 2^x$

(2, 4)
and
(-2.8, .14)

16. Solve the system of equations using the graphing calculator.

$f(x) = |x + 4| - 6$
$g(x) = -3^x + 5$

(1.54, -.46)
and
(-15, 5)

17. Solve the system of equations using the graphing calculator.

$f(x) = -\frac{1}{2}x + 7$

$g(x) = -\left(\frac{1}{2}\right)^x + 4$

(6.03, 3.98)