

## Algebra 2 Worksheet

## Section 7.5 - Solving Exponential and Log Equations #3

Name: JellyPeriod:   

I. Rewrite the exponential equation so all the bases are the same. Then solve.

1.  $4^{2x} = 32^{\frac{1}{2}}$   
 $(2^2)^{2x} = (2^5)^{\frac{1}{2}}$   
 $2^{4x} = 2^{\frac{5}{2}}$

 $\frac{4x}{4} = \frac{\frac{5}{2}}{4}$   
 $x = \frac{5}{8}$

2.  $9^x = 3^{x-2}$   
 $(3^2)^x = 3^{x-2}$   
 $3^{2x} = 3^{x-2}$

 $2x = x-2$   
 $x = -2$

3.  $2^x = 4^{x+1}$   
 $2^x = (2^2)^{x+1}$   
 $2^x = 2^{2x+2}$

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

4.  $16^{5x} = 64^{x+7}$   
 $(4^2)^{5x} = (4^3)^{x+7}$   
 $4^{10x} = 4^{3x+21}$

 $10x = 3x + 21$   
 $7x = 21$   
 $x = 3$

II. Solve by simplifying each logarithmic expression to a single logarithm and then rewriting in exponential form.

5.  $2 + \log_7(5x+3) = 5$   
 $\log_7(5x+3) = 3$   
 $7^3 = 5x+3$   
 $343 = 5x+3$   
 $340 = 5x$   
 $x = 68$

6.  $\log(3x-1) = 2 + \log 4$   
 $\log(3x-1) - \log 4 = 2$   
 $\log \frac{3x-1}{4} = 2$   
 $10^2 = \frac{3x-1}{4}$   
 $100 = \frac{3x-1}{4}$   
 $3x-1 = 400$   
 $3x = 401$   
 $x = \frac{401}{3}$

7.  $\log 5x - \log(15.5) = 2$   
 $\log \frac{5x}{15.5} = 2$   
 $10^2 = \frac{5x}{15.5}$   
 $100 = \frac{5x}{15.5}$   
 $5x = 1550$

 $x = 310$

8.  $\log_{12} x + \log_{12}(x+1) = 1$   
 $\log_{12} x(x+1) = 1$   
 $12^1 = x(x+1)$   
 $12 = x^2 + x$   
 $0 = x^2 + x - 12$   
 $0 = (x+4)(x-3)$

~~$x = 4$~~   $x = 3$

III. Solve by either taking the log of both sides OR by rewriting in logarithmic form. Round to the nearest hundredth when necessary.

9.  $4^x = 10$   
 $\log_4 10 = x$   
 $x = \frac{\log 10}{\log 4}$   
 $x \approx 1.66$

10.  $2.4^{3x+1} = 9$   
 $\log_{2.4} 9 = 3x+1$   
 $3x = \log_{2.4} 9 - 1$   
 $x = \frac{\log_{2.4} 9 - 1}{3}$   
 $x = \frac{\log 9}{\log 2.4} - 1$   
 $x \approx 0.50$

$$11. 5^{2x} - 6 = 14$$

$$5^{2x} = 20$$

$$\log_5 20 = 2x$$

$$x = \frac{\log_5 20}{2}$$

$$x = \frac{\log 20}{\log 5} \quad \boxed{x \approx 0.93}$$

$$12. 35^{\frac{x}{3}} + 7 = 12$$

$$35^{\frac{x}{3}} = 5$$

$$\log_{35} 5 = \frac{x}{3}$$

$$x = 3 \log_{35} 5$$

$$x = 3 \left( \frac{\log 5}{\log 35} \right) \quad \boxed{x \approx 1.36}$$

IV. MIX-IT-UP. Pick the best method to use and then solve. Round to two decimal places.

$$13. 16^{3x} = 8^{x+6}$$

$$(2^4)^{3x} = (2^3)^{x+6}$$

$$2^{12x} = 2^{3x+18}$$

$$12x = 3x + 18$$

$$9x = 18$$

$$x = 2 \quad \boxed{x=2}$$

$$14. 2 \log_2 x = 3$$

$$\log_2 x^2 = 3$$

$$2^3 = x^2$$

$$\sqrt{8} = \sqrt{x^2}$$

$$x = \pm \sqrt{2} \quad \boxed{x \approx 2.83}$$

$$15. \log_2 (7x+1) = \log_2 (2-x)$$

$$7x+1 = 2-x$$

$$8x+1 = 2$$

$$8x = 1$$

$$x = \frac{1}{8} \quad \text{OR} \quad x = .125 \quad \boxed{x \approx .13}$$

$$16. 3^{4x} = 90$$

$$\log_3 90 = 4x$$

$$x = \frac{\log_3 90}{4}$$

$$x = \frac{\log 90}{\log 3} \quad \boxed{x \approx 1.02}$$

$$17. 5^{x-3} - 100 = 500$$

$$5^{x-3} = 600$$

$$\log_5 600 = x-3$$

$$x = \log_5 600 + 3$$

$$x = \frac{\log 600}{\log 5} + 3 \quad \boxed{x \approx 6.97}$$

$$18. \log_4 (3x+4) = 5$$

$$4^5 = 3x+4$$

$$3x+4 = 1024$$

$$3x = 1020$$

$$x = 340 \quad \boxed{x=340}$$

$$19. \log x + \log(x+15) = 2$$

$$\log x(x+15) = 2$$

$$10^2 = x(x+15)$$

$$100 = x^2 + 15x$$

$$0 = x^2 + 15x - 100$$

$$0 = (x+20)(x-5)$$

$$x+20=0 \quad x-5=0$$

$$x \neq 20 \quad \boxed{x=5}$$

$$20. 16^{2x-1} + 7 = 29$$

$$16^{2x-1} = 22$$

$$\log_{16} 22 = 2x-1$$

$$2x = \log_{16} 22 + 1$$

$$x = \frac{\log_{16} 22 + 1}{2}$$

$$x = \frac{\log 22}{\log 16} + 1 \quad \boxed{x \approx 1.06}$$