7.5 Exponential and Logarithmic Equations Algebra 2 THOMPSON

**SAME BASES

1) Solve the equation.

$4^x = 16$ $4^x = 4^2$ bases cancel $x = 2$

2) Solve the equation.

$4^x = 256$ $4^x = 4^4$ bases cancel $x = 4$

3) Solve the equation.

$5^{5x} = 25$ $5^{5x} = 5^2$ bases cancel $5x = 2$ $x = \frac{2}{5}$

4) Solve the equation.

$3^{5x} = 81^{x+1}$ $3^{5x} = 3^{4(x+1)}$ bases cancel $5x = 4x+4$ $x = 4$

CHANGE BASE FORMULA ***BASE ON BOTTOM

5) Solve the equation.

$4^x = 9$ $x = \frac{\log 9}{\log 4}$ calculator: log9)÷log4 enter = 1.5850

6) Solve for x.

$5^{2x} = 15$ $2x = \frac{\log 15}{\log 5}$ calculator: log15)÷log5 enter ÷ 2 = 0.8

7) Solve the equation.

$3^x = 4$ $x = \frac{\log 4}{\log 3}$ calculator: log4)÷log3 enter = 1.2619

8) Solve by graphing.

$4^{6x} = 275$

$6x = \frac{\log 275}{\log 4}$ calculator: log275)÷log4 enter ÷ 6 = 0.6753

9) Solve by graphing.

$8^{x} = 2800$

$x = \frac{\log 2800}{\log 8}$ calculator: log2800)÷log8 enter = 3.8171

10) Suppose that a new employee starts working at \$7.98 per hour and receives a 3% raise each year. After time t, in years, his hourly wage is given by the equation $y = \$7.98(1.03)^t$. Find the amount of time after which he will be earning \$10.00 per hour.

After what amount of time will the employee be earning \$10.00 per hour?

$10 = 7.98(1.03)^t$

calculator: log(10/7.98)÷log1.03 enter = 7.6

ANY NUMBER TO THE ZERO POWER IS 1 $5^0 = 1$

11) Solve the equation. Check your answer.

$\log(17 - 2x) = 0$ $17 - 2x = 10^0$ $17 - 2x = 1$

$-2x = -16$ $x = 8$

12) Solve the equation. **COMBINE THE LOGS**

$\log 3x + \log x = 12$ $\log(3x^2) = 12$ $3x^2 = 10^{12}$ calculator: $10^{12} \div 3$ enter

2^{nd} x^2 end (-) enter = 577350

13) Solve the equation.

$\log 5 - \log 8x = 1$ $\log(\frac{5}{8x}) = 1$ $\frac{5}{8x} = 10^1$ cross multiply $80x = 5 = 0.0625$

14) Loudness measured in decibels (dB) is defined by loudness = $10 \log \frac{I}{I_0}$, where I is the intensity and $I_0 = 10^{-12}$ W/m^2.

The noise level inside a convertible driving along the freeway with its top up is 70 dB. With the top down, the noise level is 96 dB. Complete parts **a** and **b** below.

a. Find the intensity of the sound with the top up and with the top down.

The intensity of the sound with the top up is $I \approx$ .00001 W/m^2. $10^7 \cdot 10^{-12}$
(Round to five decimal places as needed.)

The intensity of the sound with the top down is $I \approx$ .00398 W/m^2. $10^{9.6} \cdot 10^{-12}$
(Round to five decimal places as needed.)

b. By what percent does leaving the top up reduce the intensity of the sound? $\frac{.00398 - .00001}{.00398}$ = .997 make to %

Leaving the top up reduces the intensity of the sound by 99.7 %.
(Round to one decimal place as needed.)

15) Solve the equation.

$\log_8(5x - 1) = \frac{1}{3}$ $5x - 1 = 8^{\frac{1}{3}}$ calculator: $8^{\frac{1}{3}}$ +1 enter ÷ 5 enter = 0.6