

HW 3 - Solving Equations

Solve each equation. Round to four decimal places if necessary.

1)  $2^{2x} = 4$

$$\log_2 4 = 2x$$

$$2 = 2x$$

$$x = 1$$

2)  $5^{-k} = 5^{3k-1}$

$$-k = 3k - 1$$

$$-4k = -1$$

$$k = \frac{1}{4}$$

3)  $\log_{20} (4x - 6) = \log_{20} (2x + 10)$

$$4x - 6 = 2x + 10$$

$$2x = 16$$

$$x = 8$$

4)  $\log_{17} (4a + 1) = \log_{17} (a^2 - 11)$

$$4a + 1 = a^2 - 11$$

$$0 = a^2 - 4a - 12$$

$$0 = (a - 6)(a + 2)$$

$$a = 6$$

~~a = -2~~ makes a negative log

5)  $-7 \log_{11} (p + 6) = 7$

$$\log_{11} (p + 6) = -1$$

$$11^{-1} = p + 6$$

$$\frac{1}{11} = p + 6$$

$$p = -5.9091$$

6)  $3.9 \cdot 2^{9-8p} = 91$

$$2^{9-8p} = 23.3333$$

$$\log_a 23.3333 = 9 - 8p$$

$$4.5443 = 9 - 8p$$

$$p = .5570$$

7)  $\log_8 (x + 30) + \log_8 x = 2$  **\*PRODUCT PROPERTY**      8)  $\log_6 x - \log_6 (x - 4) = 1$  **\*QUOTIENT PROP**

$$\log_8 (x^2 + 30x) = 2$$

$$8^2 = x^2 + 30x$$

$$64 = x^2 + 30x$$

$$0 = x^2 + 30x - 64$$

$$0 = (x + 32)(x - 2)$$

$$x = -32$$

makes a negative log

$$x = 2$$

$$\log_6 \frac{x}{x-4} = 1$$

$$6^1 = \frac{x}{x-4}$$

$$6x - 24 = x$$

$$-24 = -5x$$

$$x = 4.8$$

9)  $\log_3 5 - \log_3 -5x = 2$

$$\log_3 \frac{5}{-5x} = 2$$

$$3^2 = \frac{5}{-5x}$$

$$x = -\frac{1}{9}$$

$$9 = \frac{5}{-5x}$$

$$-45x = 5$$

10)  $625^{-2x} = 25^{2x}$

$$5^{4(-2x)} = 5^{2(2x)}$$

$$-8x = 4x$$

$$-12x = 0$$

$$x = 0$$

$$(25^2)^{-2x} = 25^{2x}$$

$$-4x = 2x$$

$$-6x = 0$$

$$x = 0$$

$$11) 5 - 6 \log_4 r = -19$$

$$-6 \log_4 r = -24$$

$$\log_4 r = 4$$

$$4^4 = r$$

$$256 = r$$

$$13) 8 \cdot 20^{x-8} = 1$$

$$20^{x-8} = \frac{1}{8}$$

$$\log_{20} \frac{1}{8} = x - 8$$

$$x = 7.3059$$

$$15) \log_{14} (m^2 - 51) = \log_{14} (-3m + 3)$$

$$m^2 - 51 = -3m + 3$$

$$m^2 + 3m - 54 = 0$$

$$(m+9)(m-6) = 0$$

$$m = -9$$

$$m = 6$$

makes a negative log

$$17) \log (x^2 - 10) - \log 6 = \log 9$$

$$\log \frac{x^2 - 10}{6} = \log 9$$

$$x^2 - 10 = 54$$

$$x^2 = 64$$

$$x = \pm 8$$

$$19) \log_5 -x - \log_5 2 = 2$$

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

$$5^2 = \frac{-x}{2}$$

$$50 = -x$$

$$x = -50$$

$$12) \log_{12} (4x - 10) = 1$$

$$12^1 = 4x - 10$$

$$22 = 4x$$

$$x = 5.5$$

$$14) 8 \cdot 2^{-9k-9} = 84$$

$$2^{-9k-9} = 10.5$$

$$\log_2 10.5 = -9k - 9$$

$$k = -1.3769$$

$$16) \log x = 2$$

$$10^2 = x$$

$$x = 100$$

$$18) \log_9 10 + \log_9 (x+2) = 2$$

$$\log_9 (10x + 20) = 2$$

$$9^2 = 10x + 20$$

$$81 = 10x + 20$$

$$61 = 10x$$

$$x = 6.1$$

$$20) 16^{2p+3} = \frac{1}{32}$$

$$\log_{16} \frac{1}{32} = 2p + 3$$

$$-1.25 = 2p + 3$$

$$-4.25 = 2p$$

$$p = -2.125$$