

# Solutions to Worksheet 6250

1) Rewrite each equation into either exponential or logarithmic form.

a)  $\log_6 36 = 2$

base = 6      exponent = 2

$$6^2 = 36$$

b)  $\log_{289} 17 = \frac{1}{2}$

$$289^{\frac{1}{2}} = 17$$

c)  $12^2 = 144$

base = 12      exponent = 2

$$\log_{12} (144) = 2$$

d)  $64^{\frac{1}{2}} = 8$

$$\log_{64} (8) = \frac{1}{2}$$

2) Rewrite each expression as a single logarithm.

a)  $\log 3 - \log 8$

$$\log\left(\frac{3}{8}\right)$$

b)  $\log 2 + \log 11 + \log 7$

$$\log(2 \cdot 11) + \log 7$$

$$\log(2 \cdot 11 \cdot 7)$$

$$\log(154)$$

c)  $4 \log 3 - 3 \log 4$

$$\log 3^4 - \log 4^3$$

$$\log\left(\frac{3^4}{4^3}\right)$$

$$\log\left(\frac{81}{64}\right)$$

d)  $\frac{\log 6}{3}$

$$\frac{1}{3} \log 6$$

$$\log(6^{\frac{1}{3}})$$

$$\log(\sqrt[3]{6})$$

3) Find the value of each expression.

can use change of base  
or other methods

a)  $\log_3 3.3 = n$

b)  $\log_2 30$

c)  $\log_4 5$

$$n = \frac{\log 3.3}{\log 3}$$

$$\approx \underline{\underline{1.087}}$$

change  
of  
base

$$\frac{\log 30}{\log 2}$$

$$\underline{\underline{4.907}}$$

$$\underline{\underline{1.161}}$$

4) Convert the log expression,  $\log_2 30$ , to one with only base 8.

Change of  
base formula

$$\frac{\log(30)}{\log(2)}$$

↓

$$\frac{\log_8(30)}{\log_8(2)}$$

5 a)

future value  
↓  
Present value

$$FV = PV \left( 1 + \frac{r}{n} \right)^{nt}$$

r is annual interest rate but as a decimal

n is # times per year that compounding is happening

$$FV = 11000 \left( 1 + \frac{0.10}{2} \right)^{(2 \cdot 15)}$$

$$= \$47,541.<sup>37</sup>$$

interest rate as a decimal

b)

$$F = P \cdot e^{rt}$$

future ↑ Present ↑ A value similar to  $\pi$ , but smaller

↑ # years

$$= 11000 \cdot e^{(0.1 \cdot 15)}$$

$$= \$49,298.<sup>58</sup>$$

6 Use log properties to solve each equation.

a)  $\log(-2a+9) = \log(7-4a)$

$$\begin{array}{c} \uparrow \\ -2a+9 = 7-4a \\ +4a \quad \quad +4a \end{array}$$

$$2a+9 = -7$$

$$2a = -2$$

$$a = -1$$

b)  $\log x + \log 8 = 2$

condense

$$\log(8x) = 2$$

$$10^2 = 8x$$

$$x = \frac{100}{8}$$

c)  $-6\log_3(x-3) = -24$

divide by -6

$$\log_3(x-3) = 4$$

$$3^4 = x-3$$

$$x = 3^4 + 3$$

$$\underline{\underline{x = 84}}$$

d)  $\log x + \log 7 = \log 37$

condense

$$\log(7x) = \log(37)$$

$$\downarrow \quad \quad \downarrow$$

$$7x = 37$$

$$x = \frac{37}{7}$$

7) Use log properties to solve each equation.

a)  $3^b = 17$

$$\sqrt{\log 3^b = \log 17}$$

$$b \log 3 = \log 17$$

$$b = \frac{\log 17}{\log 3}$$

$$b \approx \underline{\underline{2.579}}$$

b)  $12^x = 13$

$$x = \log_{12}(13)$$

$$x = \frac{\log(13)}{\log(12)}$$

$$\approx \underline{\underline{1.032}}$$

2nd method

Convert to log form,

Use change of base

exact in log base 2.50

c)  $5 \cdot 18^{6x} = 26$

$$18^{6x} = \frac{26}{5}$$

$$\log 18^{6x} = \log\left(\frac{26}{5}\right)$$

$$6x \cdot \log 18 = \log\left(\frac{26}{5}\right)$$

$$6x = \frac{\log\left(\frac{26}{5}\right)}{\log(18)}$$

$$x = \frac{1}{6} \left[ \frac{\log\left(\frac{26}{5}\right)}{\log 18} \right]$$

$$= \underline{\underline{0.095}}$$

exact

d)  $16^{n-7} + 5 = 24$

$$16^{n-7} = 19$$

$$\log 16^{n-7} = \log 19$$

$$(n-7) \log 16 = \log 19$$

$$n-7 = \frac{\log 19}{\log 16}$$

$$n = \frac{\log 19}{\log 16} + 7$$

$$\approx \underline{\underline{8.062}}$$