Review Exercises (Ch. 10)

1)

x	$y = 2(4)^x$
0	2
1	8
2	32
3	128

a) $y_0 = 2$

b) $b = \frac{128}{32} = \frac{32}{8} = \frac{8}{2} = 4$

3) $A = P\left(1 + \frac{r}{n}\right)^{nt}$ ← See Definition 10.2

$A = 2000\left(1 + \frac{0.068}{12}\right)^{12t}$

$A(7) = 2000\left(1 + \frac{0.068}{12}\right)^{12(7)}$

$A(7) = 2000\left(1 + \frac{0.068}{12}\right)^{84}$

$A(7) \approx \$3214.92$

5) Graph $Y_1 = 2000\left(1 + \frac{0.068}{12}\right)^{12X}$ and $Y_2 = 10{,}000$. Use [2nd] [CALC] [5] (Intersect): The IRA will be worth $10,000 in approximately 23.8 years.

7) C

9) Since 8% of each subsequent amount is lost every 5 hours, 100% – 8% = 92% remains after 5 hours. Thus we have $y = 12(0.92)^{\frac{t}{5}}$.

11) By Definition 1.2 (see Section 1.4), we have $a^{-n} = \frac{1}{a^n}$. From this we have $6^{-x} = \frac{1}{6^x}$. But $\frac{1}{6^x} = \frac{1^x}{6^x} = \left(\frac{1}{6}\right)^x$ since 1 raised to any power equals 1. Thus $6^{-x} = \left(\frac{1}{6}\right)^x$. Multiplying both sides of this equation by 20 gives us

$20(6^{-x}) = 20\left(\frac{1}{6}\right)^x$. Thus the two exponential decay functions $y = 20(6)^{-x}$ and $y = 20\left(\frac{1}{6}\right)^x$ are equivalent.

13)

a) $\log(100) = \log(10^2) = 2$

b) $\log(10{,}000) = \log(10^4) = 4$

c) $\log(\frac{1}{10}) = \log(10^{-1}) = -1$

15) $2\log(x) = 6$

$\log(x) = 3$

$10^{\log(x)} = 10^3$

$x = 10^3 = 1000$ ←Raising 10 to a power undoes the common logarithm

17)

a) $10^x = 100$

$\log(10^x) = \log(100)$

$\log(10^x) = \log(10^2)$ ←Rewrite 100 as a power of 10

$x = 2$ ←Common logarithm undoes raising 10 to a power

b) $2(10)^{\frac{x}{5}} = 20$

$(10)^{\frac{x}{5}} = 10$

$\log(10^{\frac{x}{5}}) = \log(10)$

$\log(10)^{\frac{x}{5}} = \log(10^1)$ ←Rewrite 10 as a power of 10

$\frac{x}{5} = 1$ ←Common logarithm undoes raising 10 to a power

$x = 5$

c) $10^{4x-1} = 1000$

$\log(10^{4x-1}) = \log(1000)$

$\log(10^{4x-1}) = \log(10^3)$ ←Rewrite 1000 as a power of 10

$4x - 1 = 3$ ←Common logarithm undoes raising 10 to a power

$4x = 4$

$x = 1$

19) Logarithms are exponents. The domain excludes negative values of x because there is no power (exponent) of 10 that results in a negative number.

21) $6.1 - 3.1 = 3$

An earthquake with Richter magnitude 6.1 is $10 \quad 10 \quad 10 = 10^3 = 1000$ times stronger than an earthquake with a magnitude of 3.1.

23) Parts (a) and (c) could be evaluated mentally because the given concentrations are powers of 10 and taking the common logarithm “undoes” this:

a) $pH = -\log(1.0 \quad 10^{-13}) = -\log(10^{-13}) = -(-13) = 13$

c) $pH = -\log(1.0 \quad 10^{0}) = -\log(10^{0}) = 0$