Math 120 Exam #4 Key (Fall 2021)

1 $A = 6000(1 + 0.0088/4)^{16} = \$6214.72$, $A = 6000e^{0.0084(4)} = \$6205.03$. The quarterly compounded investment reaps the greater reward.

2a $(-\infty, 9)$

2b Need $x^2 - 4x - 12 > 0$, so domain is $(-\infty, -2) \cup (6, \infty)$.

3 $\log_4 \dfrac{x^{1/3}(x+1)^2}{y^{1/3}}$.

4 $C - 2A$

5a $5^{2-x} = 5^{-3}$ implies $2 - x = -3$, so $x = 5$.

5b Let $u = e^x$, so $u^2 - 2u - 3 = 0$, giving $e^x = u = -1, 3$. But $e^x = -1$ has no solution, leaving $e^x = 3$ to yield the final solution $x = \ln 3$.

5c $2^5 = 4x + 1$, giving $x = \frac{31}{4}$.

5d Write $\log(x+3)(x-2) = \log 14$, so $(x+3)(x-2) = 14$, giving $x = -5, 4$. But -5 is extraneous, so solution set is $\{4\}$.

6 For $A(t) = A_0 e^{-kt}$ we have $\frac{1}{2}A_0 = A(7340) = A_0 e^{-7340k}$, so $e^{-7340k} = \frac{1}{2}$, and hence $k = 0.00009443$. The completed model is now $A(t) = A_0 e^{-0.00009443t}$, and we find t such that $A(t) = 0.18A_0$. This implies

$$A_0 e^{-0.00009443t} = 0.18A_0,$$

or $e^{-0.00009443t} = 0.18$. Solving, we get $t \approx 18{,}159$ years.

7 Solution is $(-6, -2)$.

8 x mℓ of 34% solution added to y mℓ of 4 % solution are to be mixed to give $x + y = 100$ mℓ of 7% solution. Equations in the system are $x + y = 100$ and $0.34x + 0.04y = 0.07(100) = 7$. Solution: 10 m$\ell$ of 34% and 90 mℓ of 4%.

9 Solution is $(0, 1, 2)$.

10 Solution set is $\{(0, 0), (-2, 2), (2, 2)\}$.

11 Two equations result: $2x + 2y = 26$ and $xy = 40$. Solving gives a 5 m $\times$ 8 m rectangle.