Assignment 12 (SOLUTION from Textbook Manual Solution)

Text: *Calculus for the Life Sciences, S. Schreiber, K. Smith and W. Getz, Wiley, 2014*

Section 6.1

9. We have to solve $2 = e^{0.64t}$; we obtain $t = \ln 2/0.64 \approx 1.083$ years.

13. We have to solve $1/2 = e^{-0.03t}$; we obtain $t = \ln(1/2)/(-0.03) \approx 23.1049$ centuries, or

17. We have to solve $0.1 = e^{-0.0025t}$; we obtain $t = \ln(0.1)/(-0.0025) \approx 921.03$ years.

29. If the half-life is 5 days, then $N_0/2 = N_0 e^{-\lambda \cdot 5}$, thus $\lambda = (\ln 2)/5 \approx 0.1386$.

Section 6.2

19. Integrating both sides, we obtain $y = \sin t + C$.

21. Separating the variables, $e^y dy = dt$, thus integration gives $e^y = t + C$ and then $y = \ln(t + C)$.

22. Clearly, $y = 1$ is a solution. Separating the variables, $(1/(y-1))dy = dt$, thus integration gives $\ln(y-1) = t + \tilde{C}$ and then $y = 1 + Ce^t$.

23. Clearly, $y = 0$ is a solution. Separating the variables, $(1/y)dy = 3xdx$, thus integration gives $\ln y = 3x^2/2 + \tilde{C}$ and then $y = Ce^{3x^2/2}$.

29. Separating the variables, $(1+y)^{-2}dy = dt$, thus integration gives $-1/(1+y) = t + C$. The initial condition shows that $-1/(1+2) = 0 + C$, thus $C = -1/3$ and then $y = 1/(1/3 - t) - 1$.

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35. Separating the variables, we obtain $1/(y(y-1))dy = (1/(y-1) - 1/y)dy = dt$, thus integration gives $\ln|y-1| - \ln y = t + C$. The initial condition shows that $0 = 0 + C$, thus $C = 0$ and then $\ln(|y-1|/y) = t$, which gives $y = 1/(1+e^t)$.

Section 6.3

3. Using the result of Example 1, $1/2 = e^{-b\cdot(4/24)}$, thus $b = 6\ln 2 \approx 4.1589$. Also, $0 = a - bV$, thus $a = bV \approx 4.1589 \cdot 2.25 \cdot 10^5 \approx 935,700$.