7-8 Practice

1. BACTERIA

$y = ae^{kt}$

$2000 = 20e^{0.614t}$

$100 = e^{0.614t}$

$0.614t = \ln 100$

$t = \frac{\ln 100}{0.614}$

$\boxed{t = 7.5 \text{ hours}}$

#2. RADIOACTIVE DECAY

$y = ae^{kt}$

$\frac{1}{2} = e^{k(32)}$

$\ln \frac{1}{2} = 32k \ln e$

$k = \frac{\ln(\frac{1}{2})}{32} = -0.02166$

#3. RADIOACTIVE DECAY

$y = ae^{kt}$

$\frac{1}{2} = e^{5.7k}$

$\ln \frac{1}{2} = 5.7k$

$k = \frac{\ln(\frac{1}{2})}{5.7}$

$\boxed{k = 0.1216}$

#4 WHALES

$0.0025 = e^{0.00012k}$

$\ln 0.0025 = 0.00012k$

$k = \frac{\ln(0.0025)}{0.00012}$

$\boxed{k = 49{,}928.9 \text{ yr}}$

#5. POPULATION

$P(t) = 8e^{0.26t}$

$25{,}000 = 8e^{0.26t}$

$\frac{\ln 3125}{.26} = t$

$\boxed{t = 4.38 \text{ yrs}}$

#6. RADIOACTIVE DECAY

$A = Ae^{-0.04463t}$

$A = 50e^{-0.04463(10)}$

a) about 32 grams

$A = 50e^{-0.04463(30)}$

b) 13.1 grams

7-8 practice

7. Population

$A = pe^{kt}$

$5e^{.03(17)}$

about 8.3 million

8. $y = 80e^{kt}$

$10{,}000 = 80e^{0.071t}$

$125 = e^{0.071t}$

$\ln 125 = \ln e^{0.071t}$

$0.071t = \ln 125$

$t = \frac{\ln 125}{0.071}$

$t = 68$ hours

9. Logistic Growth

$P(t) = \frac{16{,}300}{(1 + 17.5e^{-0.065t})}$

Max Pop 6,300

$16{,}200 = \frac{16{,}300}{1 + 17.5e^{-0.065t}}$

$1 + 17.5e^{-0.065t} = \frac{16300}{16200} / 17.5$

$\ln e^{-0.065t} = \ln\left(\frac{16300/175}{16{,}200} - 1\right)$

$-0.065t = \ln\left(\frac{16300/175}{16200} - 1\right)$

$t = \ln\left(\frac{16300/175}{16200} - 1\right) / -0.065$

$t = \ln\left(\frac{\frac{16300}{16200} - 1}{17.5}\right) / -0.065$

$1 + 17.5e^{-0.065t} = \frac{16{,}300}{16{,}200}$

$= 1.00617$

$17.5e^{-0.065t} = 0.00617$

$e^{-0.065t} = .0003526$

$\ln e^{-0.065t} = \ln 0.0003526$

$-0.065t = \ln 0.0003526$

$t =$ 122.3 hours