§3.5 p 264 #7-13 odd, 37, 41, 45, 49

(7) $2000 = 1000e^{.035t}$

$2 = e^{.035t}$

$\ln 2 = .035t$

$t = \frac{\ln 2}{.035} \approx 19.8$ yrs

$P = 1000e^{.035(10)} \approx \$1{,}419.07$

(9) $1500 = 750e^{r(7.75)}$

$2 = e^{r(7.75)}$

$\ln 2 = r(7.75)$

$r = \frac{\ln 2}{7.75} \approx .089 \Rightarrow 8.9\%$

$P = 750e^{.089(10)} \approx \$1{,}826.35$

or 1834.36 if using 8.9438%

(11) $1505 = 500e^{10r}$

$\frac{301}{100} = e^{10r}$

$10r = \ln \frac{301}{100}$

$r = \left(\ln \frac{301}{100}\right)/10 \approx .110194 \rightarrow 11.0194\%$

$1000 = 500e^{.110194t}$

$t = (\ln 2)/.110194 \approx 6.29$ yrs

(13) $10000 = Pe^{.045(10)}$

$P = \frac{10000}{e^{.045(10)}} \approx \boxed{\$6376.28}$

$12752.56 = 6376.28\, e^{.045t}$

$t = \frac{\ln 2}{.045} \approx \boxed{15.4 \text{ yr}}$

(37) $10000 = 4080 e^{k(3)}$

$\frac{125}{51} = e^{3k}$

$k = \left(\ln \frac{125}{51}\right)/3 \approx .2988$

$\text{hits} = 4080 e^{(.2988)24} \approx 5{,}309{,}734$ hits

(41) $\boxed{R = \frac{1}{10^{12}} e^{-t/8223}}$ carbon dating model.

(a) $\frac{1}{10^{12}} e^{-t/8223} = \frac{1}{8^{14}}$

$e^{-t/8223} = \frac{10^{12}}{8^{14}}$

$\frac{-t}{8223} = \ln\left(\frac{10^{12}}{8^{14}}\right)$

$-t = 8223 \ln\left(\frac{10^{12}}{8^{14}}\right) \approx -12179.6$

$\Rightarrow \boxed{12{,}180 \text{ yrs old}}$

(b) $\frac{1}{10^{12}} e^{-t/8223} = \frac{1}{13^{11}}$

$\Rightarrow t = -8223 \ln\left(\frac{11^{12}}{13^{11}}\right) \approx 4797$ yrs old

(45) $s(t) = 100(1-e^{kt})$

(a) $15 = 100(1-e^{k(1)})$

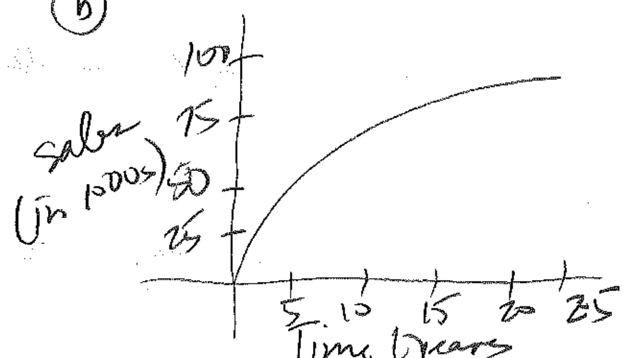
$\frac{3}{20} = 1-e^{k}$

$e^{k} = \frac{17}{20}$

$k = \ln\left(\frac{17}{20}\right) \doteq -.1625$

$s(t) = 100(1-e^{-.1625t})$

(b)



55.625 $\Rightarrow$

(c) $s(5) = 100(1-e^{-.1625(5)}) \doteq 55,625$ units

(49) $$p(t) = \frac{1000}{1+9e^{-0.1656t}}$$

(a) $$P(5) = \frac{1000}{1+9e^{-0.1656(5)}} \approx 202.7 \Rightarrow 203 \text{ animals}$$

(b) $$500 = \frac{1000}{1+9e^{-.1656(t)}}$$

$$1+9e^{-.1656t} = \frac{1000}{500} = 2$$

$$e^{-.1656t} = \frac{1}{9}$$

$$-.1656t = \ln\left(\tfrac{1}{9}\right)$$

$$t = \ln\left(\tfrac{1}{9}\right)/-.1656 \approx 13.27 \text{ months}$$

(c) horizontal asymptotes at $y=0$ & $y=1000$

The population will approach 1000 as time increases