

Assignment # 3

HW # 3 5.3 p 414 # 2, 4, 12, 16, 18, 20, 40

2. a. $S = 100,000e^{-0.5(10)} = \673.79

b. $400 = 100,000e^{-0.5x}$

$$0.004 = e^{-0.5x}$$

$$\ln(0.004) = \ln(e^{-0.5x})$$

$$\ln(0.004) = -0.5x$$

$$\frac{-5.5215}{-0.5} = x$$

$$x = 11.04 \rightarrow \text{twelfth week}$$

4. a. $f = e^{-0.15(5)} = 0.4724$

b. $0.1 = e^{-0.15x}$

$$\ln(0.1) = -0.15x$$

$$\frac{\ln(0.1)}{-0.15} = x$$

$$15.35 = x$$

After 15 years there will be $\frac{1}{10}$ in service.

12. $60 = 200(0.01)^{0.8^t}$

$$0.3 = (0.01)^{0.8^t}$$

$$\ln 0.3 = \ln \left[(0.01)^{0.8^t} \right]$$

$$-1.204 = 0.8^t \ln(0.01)$$

$$-1.204 = -4.6052(0.8^t)$$

$$0.2614 = 0.8^t$$

$$\ln(0.2614) = \ln(0.8^t)$$

$$-1.3417 = t \ln 0.8$$

$$t = 6.013$$

After 6 days, during the 7th day.

16. a. $N(t) = \frac{50,500}{1 + 100e^{-0.7t}} = \frac{50,500}{101} = 500$

b. Since denominator is never less than one, the upper bound is 50,500.

c. $0.75(50,500) = \frac{50,500}{1 + 100e^{-0.7t}}$

$$1 + 100e^{-0.7t} = \frac{4}{3}$$

$$e^{-0.7t} = \frac{1}{300}$$

$$-0.7t = \ln\left(\frac{1}{300}\right)$$

$$t = \frac{\ln\left(\frac{1}{300}\right)}{-0.7}$$

$$t = 8.148$$

After 8 days

18. a. $p = 3000e^{-6/3} = 3000e^{-2} = \406

b. $149.40 = 3000e^{-q/3}$

$$0.0498 = e^{-q/3}$$

$$\ln(0.0498) = \ln(e^{-q/3})$$

$$-3 = -\frac{q}{3}$$

$$9 = q$$

20. $p = 200(2^5) = 200(32) = \6400

40. a. When $t = 12$,

$$x = 50 - 40e^{-0.05(12)} = 28.0475.$$

b. $45 = 50 - 40e^{-0.05t}$

$$-5 = -40e^{-0.05t}$$

$$0.125 = e^{-0.05t}$$

$$\ln(0.125) = \ln(e^{-0.05t})$$

$$-2.0794 = -0.05t$$

$$t \approx 42 \text{ months}$$