

Calc Bc

G-5 Pg 364 # 32, 34, 35, 37, 41, 44

$$(32) \quad P(t) = \frac{200}{1 + e^{5.3 - t}}$$

$$\begin{aligned} a) \quad P(t) &= \frac{200}{1 + e^{5.3} \cdot e^{-t}} \\ &= \frac{m}{1 + A \cdot e^{-k \cdot t}} \end{aligned}$$

$$a) \quad k = 1, \quad m = 200$$

$$b) \quad P(0) = \frac{200}{1 + e^{5.3}} \approx 1$$

1 student initially infected

$$\begin{aligned} (34) \quad \frac{dP}{dt} &= 0.0004 P(250 - P) \\ &= \frac{1}{250} P(250 - P) \end{aligned}$$

$$k = .1, \quad m = 250$$

$$P(t) = \frac{250}{1 + A \cdot e^{-.1t}}$$

$$P(0) = 20$$

$$A = 7.9286$$

$$P(t) = \frac{250}{1 + 7.9286 e^{-.1t}}$$

b) ? Never reaches 250

$$(35) \quad \frac{dP}{dt} = kP(m - P)$$

$$\frac{1}{P(m - P)} dP = k dt$$

$$\left(\frac{\frac{1}{m}}{P} + \frac{\frac{1}{m}}{m - P} \right) dP = k dt$$

$$\left(\frac{1}{P} + \frac{1}{m - P} \right) dP = m k dt$$

$$\ln|P| - \ln|m - P| = m k t + C$$

$$\ln \left| \frac{P}{m - P} \right| = C e^{m k t}$$

$$\frac{m - P}{P} = A e^{-m k t}$$

$$m - P = P A e^{-m k t}$$

$$m = P + P A e^{-m k t}$$

$$m = P(1 + A e^{-m k t})$$

$$P = \frac{m}{1 + A e^{-m k t}}$$

37

$$a) P = \frac{232,740}{1 + 14.582 e^{-.101}}$$

(from calculator)

b) 232,740 people

$$c) 225,000 = \frac{232,740}{1 + 14.582 e^{-.101t}}$$

$$14.582 e^{-.101t} = \frac{232,740}{225,000} - 1$$

$t \approx 60$ yrs or 2010

$$d) \frac{dP}{dt} = kP(M-P)$$

$$M = 232,740$$

$$mk = -.101$$

$$\text{so } k = \frac{mk}{M} = -4.3396 \times 10^{-7}$$

$$\frac{dP}{dt} = (-4.3396 \times 10^{-7}) P (232,740 - P)$$

$$41) \frac{600}{2} = 300 \quad \text{D}$$

$$44) \quad B$$