Mathematics 172

Quiz 29 Name: Key

You must show your work to get full credit.

For the SIR model

$$\Delta S = -bSI$$
$$\Delta I = bSI - kI$$
$$\Delta R = kI$$

with

$$b = .002 \qquad k = .4 \qquad S_0 = 495 \qquad I_0 = 5 \qquad R_0 = 0$$

1. With this data what is the is a approximate average length of an infection?

This is $\frac{1}{k} = \frac{1}{.4} = 2.5$

Average length is 2.5 days

2. Use your calculator to to plot the first 20 days of the infection.

(a) What are

$S_5 =$ 424.3 $I_5 =$ 45.5 $R_5 =$ 30.2

Move on the curves using trace

(b) When does the infection peak and what is the largest number of infected?

Day infection peaks $t = 10$ Maximum number of infecteds 134.83

Use trace to move on the infected curve to see where maximum is.

3. If the duration of the infections is doubled, which is the same as halving k we get $k = .2$. Redo Problem 2 with this change.

(a) What are

$S_5 =$ 397.0 $I_5 =$ 81.7 $R_5 =$ 21.3

(b) When does the infection peak and what is the largest number of infected?

Day infection peaks $t = 10$ Maximum number of infecteds 271.8