Homework 3 Solutions

Solutions to CiC Section 1.1, #1-6

The questions refer to the graphs on page 17 of the CiC book, at the beginning of the problem section.

1. The infection hits its peak at approximately day 15. On day 15 approximately 14,000 people are infected.

2. Initially over 40,000 people are susceptible, with my estimate from the graph being 44,000 initial susceptibles. It takes almost 18 days for the susceptible population to be cut in half.

3. It takes about 35 days for the recovered population to reach 25,000. Eventually there are around 50,000 people who are in the recovered population; about 45,000 of these recovered from the disease during this outbreak (subtract R_0 from the end population). This information can be obtained from looking at the graph of the recovered population.

4. Around day 8 the infected population is increasing most rapidly; it is decreasing most rapidly around day 18. These are the days with, respectively, the most positive and negative slopes.

5. Approximately 28,000 people have caught the disease by day 20. This information can be obtained by looking at the graph of the susceptible population since all susceptibles who leave the population do so because they have become infected (this is an assumption of the model). Therefore you can subtract how many are left in that population at day 20 from the initial population size.

6. When the graph of S is superimposed on the graph of R, it is compressed (horizontally) in order to make the time scales match up. (This graph is on the following page.)

Written Solution to Number 3 of the Homework "7" Worksheet

3. When you start with the initial values $H(0) = 1.5$ and $F(0) = 0.5$ no changes in the population sizes occur. No changes occur because the derivatives, or rate equations, $H'(t)$ and $F'(t)$ are equal to zero for these values. Sidenote: *This point* $(H(t) = 0.5, F(t) = 1.5)$ *is called an equilibrium point.* The graphs for this homework are attached.