1. LOST: A plane crashes on a deserted, isolated island and there are 30 survivors. Unfortunately, one of the survivors is already infected with a virus (not deadly, if treated in a timely manner). Viruses spread at a rate that is proportional to the interaction of the number of people who have the virus and the number of people *not* infected. After one week, three people are infected.

Follow the steps below to construct the model.

(a). Let N be the number of people infected after t weeks. What is the expression for the number of people not infected?

(b). What is the expression representing the *interaction* between infected (N) and non-infected (part a) persons?

(c). Mathematically, what represents the *rate* at which the virus spreads? [i.e. What represents the *rate* at which the number of infected persons changes?]

(d). Use parts (a)-(c) to write down a differential equation for the sentence underlined above. [Use a for the proportionality constant.]

(e). What is the initial condition (at $t = 0$)? i.e. $N(0) =$

(f). You should be able to write your equation in part(d) so that it is in the same form as the Logistic Model. [If it doesn't already look like the logistic model, then rewrite it.]

(g). Using the solution to the Logistic Model from your notes, write down the solution to the differential equation in part (f). Fill in any values that you know.

(h). What part of the solution do you still need to find? Use information given in the problem statement to help you find it.

(i). How many people are infected after 2 weeks?

(j). How many days do they have to be rescued before everyone becomes infected? [Note: The solution will only equal 30 in the limit as $t \to \infty$, so consider when 29 are infected. Then any time after that, the 30th person will become infected.]

Homework: Section 2.3, p. 47: #10, 11; Section 2.5, p. 67: #22