MATH 245, Spring 2013
Homework 5
due 10:50AM on Monday, April 29.

Background reading: Sections 5.1, 1.7, 4.1, and 4.2.

Follow the posted homework guidelines when completing this assignment.

5-1. (6 pts) Recall that our waiting room simulation is the following:

```
nwait = 0; busy = 0; endTime = 0;
For[i = 0, i < 180, i++,
   If[endTime == i, busy = 0];
   newPatient = If[RandomReal[] <= 0.075, 1, 0];
   If[newPatient == 1, nwait++];
   If[busy == 0 && nwait > 0, nwait--; busy = 1; endTime = i + 15];];
nwait
```

What goes wrong with our simulation **if we remove the first line of code**? Why should we expect something to be different in how this modified code models the waiting room? Describe exactly what happens in the computer memory when this code is run multiple times.

[*I suggest running this modified program multiple times to collect data to see what is happening.*]

5-2. (7 pts) In this problem you will modify the waiting room algorithm from the notes and tutorial in order to better simulate the arrival of patients. Suppose that up to two patients may arrive at any one time and that the probability that two patients arrive in one minute is less than the probability that one patient arrives in one minute. Choose arrival probabilities that continues to ensure that the expected number of patients that arrive in any day is 13.5. (Make sure that you justify that your probability choices ensure this restriction.) Run your simulation 1000 times to determine if your modification increases, decreases, or keeps the same the expected number of patients in the waiting room at noon. Discuss whether the answer you find is what you expected to find.

5-3. (7 pts) For the optimization problem 4.2.15 given on page 262 of the textbook, do the following steps.

(a) Write down the linear optimization problem in standard form.

(b) Draw the feasible region.

(c) Find the optimal solution by hand.

(d) Use Mathematica to solve the optimization problem.