Homework 1 - Math 381 A - Dr. Matthew Conroy

1. Consider the salsa-and-guacamole scenario from this weeks's lecture. Suppose we sell salsa for \$1 per unit, and guacamole for \$ z per unit. Depending on the value of z, we would maximize revenue by making all salsa, all guacamole, or some of each. Describe the range of z values corresponding to each type of solution, and give plenty of justification. (Be sure to carefully consider the boundary cases! Software (e.g., lpsolve) should not be used for this problem.)

2. Suppose you have the following unique objects (there is only one of each object), each with a weight, a volume and a value, as shown.

object	weight	volume	value
1	10	5	72
2	11	6	80
3	7	10	66
4	12	4	75
5	3	9	68
6	4	8	50
7	9	12	85
8	2	10	55
9	8	8	82

   Which objects should you put in a knapsack with weight capacity 40 and volume capacity 45 such that the total value is maximized?

   Define an IP for this problem. Then solve it with lpsolve. Include all input and output to lpsolve, and comment on the solution (i.e., don't just post the output of lpsolve). Are the constraints binding or not?

   Now, solve the problem again, this time assuming that the list above gives a list of *types* of objects, and there is an unlimited number of each object type. What should go in your knapsack now?