Econ 172A, Fall 2007: Problem Set 2

Instructions: Due: Never. (This problem set covers material that is "fair game" for the midterm examination.)

1. The associated excel spread sheet contains three pages. One contains a linear programming template with a specific problem. One is labeled "BLANKS WITHOUT ANSWERS." One is labeled "Answers." Go to the page labeled "BLANKS WITHOUT ANSWERS" and fill in as many of the blanks ((a)-(ii)) as you can without referring to the other pages. Obviously you can check your answers using the other pages. Most of the blanks can be completed without additional information.

2. Suppose you solved a linear programming problem of the form $\max c \cdot x$ subject to $Ax \leq b$ and $x \geq 0$. You learned that the solution was x^* and the value was $c \cdot x^*$. Now someone told you that the nonnegativity constraint on x_1 ($x_1 \geq 0$) was replaced by $x_1 \geq d$. What can you say about the solution and value of the new problem as d varies? Is there any information on an Excel sensitivity report that helps you figure out the answer? Explain as carefully as possible.

3. This is the first practice formulation problem:

   A nut packer has on hand 150 pounds of peanuts, 100 pounds of cashews, and 50 pounds of almonds. The packer can sell three kinds of mixtures of these nuts: a cheap mix consisting of 80% peanuts and 20% cashews; a party mix with 50% peanuts, 30% cashews, and 20% almonds; and a deluxe mix with 20% peanuts, 50% cashews, and 30% almonds. If the 12-ounce can of the cheap mix, the party mix, and the deluxe mix can be sold for $.90, $1.10, and $1.30 respectively, formulate a linear programming problem that determines the number of cans of each type the producer should produce to maximize her return.

   You may formulate this problem yourself or look up the answer (it is posted with the solutions to the practice formulation problems).

   (a) I have posted Excel answer and sensitivity reports on the class web page. Use them to answer as many of the following questions as possible. If you cannot answer the question using these reports, use Excel and resolve the problem.

   (b) What happens to the solution and to profits if the price of cheap mix goes up to $1.00 per can?

   (c) What happens to the solution and to profits if the price of cheap mix falls to 50 cents per can?

   (d) What would happen to the profits of the nut packer if she lost 20 pounds of peanuts?

   (e) How much would the nut packer be willing to pay for an extra 10 pounds of almonds?

   (f) Imagine a new product called alshews that is 50% almonds and 50% cashews. What would the price of a 12-ounce can of alshews need to be for it to be profitable (relative to the nut packer's other options) to sell them?

   (g) Suppose that the nut packer was prohibited from selling more than 100 cans of cheap mix. How would the solution and profit change?

   (h) Suppose that the nut packer had to sell at least 100 cans of party mix. How would the solution and profit change?

   (i) Suppose that the nut packer receives 100 pounds of a miracle nut that can replace any kind of nut in any of the mixtures. How would this change her profit and production plans?