

IE 2001: OPERATION RESEARCH

(Homework Assignment 3: Due February 2, 2012)

1. Formulate Problem 51, page 122. (Silvco)
2. Formulate Problem 52, page 122. (Paper Recycling)

Again, for both problems, **draw schematic diagrams or pictures** of the system being modeled - this will make things easier...

3. A chemical company produces four different chemicals (A, B, C and D) using two different reaction processes (1 and 2). For each hour that Process 1 is run, it yields 400 lbs. of A, 100 lbs. of B and 100 lbs. of C. For each hour that Process 2 is run, it yields 100 lbs. of A, 100 lbs. of B and 100 lbs. of D. The marketing department has specified that the daily production should be (1) no more than 500 lbs. of B and 300 lbs. of C, and (2) at least 800 lbs. of A and 100 lbs. of D.
 - a) Formulate the above as linear program, sketch the feasible region and compute the values of all variables at each of its extreme points.
 - b) Suppose it costs \$4 to run Process 1 for 1 hr., and \$2 to run Process 2 for 1 hr. Sketch an isocost line on your graph. Graphically find the optimal production plan, and the optimal cost. Which constraints are active and which ones inactive at the optimum? Compute the slack or excess values for each constraint at the optimum.
 - c) Repeat (b) but for costs of \$5 per hr. for Process 1 and \$1 per hr. for Process 2.
 - d) Suppose that the costs are as in (c) and that each lb. of the chemicals A, B, C and D sell respectively for 1, 5, 5 and 4 cents. What is the optimum solution? If there is more than one optimum solution, characterize the complete set of optimum solutions. What is the optimum value of the objective?
4. Consider the following LP:
$$\begin{array}{ll} \text{Min} & -2x_1 + 6x_2 \\ \text{st} & x_1 + x_2 \geq 2 \\ & -x_1 + x_2 \leq 1 \\ & x_1 \geq 0, \quad x_2 \geq 0 \end{array}$$
 - a. Sketch the feasible region. What can you say about the same?
 - b. Does the problem have an optimal solution? If so, where? If it does not, then why not?
 - c. How (if at all) do your answers change if the objective is to maximize the same objective?
5. Read Chapter 2 in your text. Focus on Sections 2-1, 2-2, 2-3 (especially this one), and 2-5. This is stuff that you should (hopefully...) have already seen in an undergraduate linear algebra class (e.g., Math 0250) and should be in the nature of a review. If you have the time, work out a couple of problems at the end of each section - I'd like you to all become re-acquainted with vectors, matrices and systems of linear equations. You should begin reviewing these topics now so that you don't get lost when we hit Chapter 4 and (especially) Chapter 6.