COMP566

Homework 1 Due: Tues September 23, 2008

1. A company must distribute its product from two warehouse locations to two retail outlets. Warehouse A has a total of 68 units and warehouse B has a total of 80 units. Demand is 36 units for retail outlet 1 and 72 units for retail outlet 2. The unit shipping costs from warehouse A are $6 to outlet 1 and $8 to outlet 2, and from warehouse B they are $4 to outlet 1 and $3 to outlet 2. Demand should be exactly satisfied at minimum cost.
(a) Formulate this problem as a linear program and convert it to standard form. Solve the problem using lp_solve or CPLEX (see Announcements on course home page).
(b) The company wants to keep its shipments relatively balanced from each warehouse. This means that the ammount shipped from a warehouse must not exceed by more than 10% the ammount shipped from the other warehouse. Find the minimum cost shipment schedule with this new constraint using lp_solve or CPLEX.

2. Solve the following LP by hand using the simplex method and Bland's least subscript rule.

$$\max x_1 + 3x_2 - 2x_3$$

$$-2x_1 + x_2 + 3x_3 \le 6$$

$$x_1 + x_2 + 4x_3 \le 10$$

$$x_2 + 2x_3 \le 6$$

$$-3x_1 + 5x_2 + 14x_3 \le 34$$

$$x_1, x_2, x_3 \ge 0$$

For each pivot, list the entering and leaving variable and show the dictionary. You may use Maple or some other system to solve the systems of equations.

3. An inequality is *redundant* in a linear program if by deleting it you do not change the set of feasible solutions.
(a) Show how to use linear programming to detect if a given inequality is rededundant for a given linear program.
(b) Apply your technique to the LP in problem 2 to determine which, if any, of the four constraints are redundant. You may use lp_solve or CPLEX to solve the LPs.

Policy on Late Assignments: -10% per day, including weekends. Assignments are due in class. Hand in late assignments to Conor Meagher, MC232.