Midterm Examination II

CS 525, Semester I, 1999-2000

Wednesday November 10, 1999

If a problem has no solution or an infinite number of solutions, you must clearly state so and *justify* your claim. Each problem can be solved in 3 tableaus or less including the initial tableau.

1. (a) Solve:

$$\begin{array}{lrcl} \max & 3 + x_1 - x_2 + x_3 & & \\ \text{subject to} & x_1 - x_2 + 4x_3 & \leq & 0 \\ & x_1 - x_2 & = & -1 \\ & x_1 + x_3 & \geq & -2 \\ & x_1 \text{ free}, x_2 \geq 4, x_3 \geq 0 & & \end{array}$$

   Hint: you may want to substitute $y_2 = x_2 - 4$.

   (b) Is the optimal solution unique? How many optimal basic feasible solutions are there?

2. Consider the problem (x_3 is free):

$$\begin{array}{lrcl} \min & x_1 + x_2 - x_3 & & \\ \text{subject to} & x_1 + x_2 & \leq 1 & \\ & 5x_2 + x_3 & \geq & 3 \\ & x_1 + x_2 + x_3 & = & -1 \\ & x_1, x_2 & \geq & 0 \end{array}$$

   (a) Write down the dual of this problem and a feasible point for the dual problem.

   (b) Determine a lower bound on the objective value of the original problem without constructing any tableaus.

   (c) How would you generate an upper bound for the (optimal) objective value of the original problem?