308-566 Discrete Optimization

Homework 2 Due: Tuesday, October 8, 2002 (in class)

Page numbers refer to Linear Programming, V. Chvatal

1. For each example in Ex 3.9, text p. 44, either find a feasible solution or show there is none, by using the method in the class handout. If there is no feasible solution, find the y vector in Farkas' lemma. (http://cgm.cs.mcgill.ca/~avis/courses/566/brule.ps).

2. Write down the dual of the following problem by: transforming to standard form, taking the dual, and then simplifying the result.

$$\textit{maximize} \quad z = x_1 + 2x_2 - 3x_3$$

$$-3x_1 + x_2 + 2x_3 = 16$$

$$2x_1 + 4x_2 + 3x_3 \geq 20$$

$$x_1 \geq 0, x_2 \geq 0$$

3. Exercise 5.9, text p. 70.

4. Use the strong duality and complementary slackness theorems (only!) to prove that $x = (10, 0, 16, 6)$ is an optimal solution to

$$\textit{maximize} \quad z = x_1 + 2x_2 + 5x_3 + x_4$$

$$x_1 + 2x_2 + x_3 - x_4 \leq 20$$

$$-x_1 + x_2 + x_3 + x_4 \leq 12$$

$$2x_1 + x_2 + x_3 - x_4 \leq 30$$

$$x_j \geq 0 \qquad j = 1, \ldots, 4$$