CSC 445/545: Midterm Exam
Fall 1992

1. [25] Apply Phase 1 of the two-phase Simplex method to the following problem to determine if it is feasible.

$$\begin{aligned} \textit{Max} \quad & -x_1 - x_2 - x_3 \\ \text{subject to} \quad & -2x_1 + 5x_2 + 7x_3 \leq -2 \\ & 1x_1 - 2x_2 + 3x_3 \leq -3 \\ & x_1, x_2, x_3 \geq 0 \end{aligned}$$

2.(a) [5] Write down the dual problem from Question #1, and then convert it to standard form.

(b) [15] Apply the Simplex method to the dual problem from (a) to find the optimal solution. Use the largest coefficient rule to decide which variable enters the basis.

(c) [5] Explain what (if anything) you can determine about the primal problem given your answer to (b).

3. Consider the following problem:

$$\begin{aligned} \textit{Max} \quad & x_1 + x_2 \\ \text{subject to} \quad & 3x_1 + 4x_2 \leq 6 \\ & -3x_1 + 8x_2 \leq 5 \\ & x_1, x_2 \geq 0 \end{aligned}$$

(a) What is the dual problem?

(b) Apply the complementary slackness conditions to determine if $x_1 = 0$, $x_2 = 5/8$ is an optimal solution to the primal.

(c) Apply the complementary slackness conditions to determine if $x_1 = 2$, $x_2 = 0$ is an optimal solution to the primal.

4. Discuss termination of the Simplex method. (When does it terminate? How long does it take to terminate on practical problems and how long in the worst case?) You can state results but there is no need to include any proofs.