Midterm Examination I

CS 525 - Spring 2005

Monday, March 14, 2005, 2:25-3:25pm

Each question is worth 20 points. Each problem that involves tableaus can be solved in three pivots or fewer.

If a problem has no solution or multiple solutions, you must state so clearly and justify your claim.

No calculators allowed, You may bring one standard-size sheet of paper, handwritten on both sides, into the test.

1. (a) Describe the solution set for the following problem. If there are no solutions, write out the dependence relationship between the rows of the coefficient matrix.

\[
\begin{align*}
-x_1 + 2x_2 - 4x_3 + x_4 &= 1, \\
3x_1 - x_2 + 2x_3 &= 2, \\
x_1 + 3x_2 - 6x_3 + 2x_4 &= 5. \\
\end{align*}
\]

(b) Repeat part (a), with the right-hand side of the third equation replaced by 4.

2. Solve the following problem:

max \[-x_1 + 2x_2 - 2x_3\]

subject to \[-x_1 + x_2 - 3x_3 \geq 1, \\
x_1 + 4x_2 + 4x_3 \leq 3, \\
4x_1 + x_2 - 6x_3 \leq 4, \\
x_1, x_2, x_3 \geq 0.\]