

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 tableaux 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.

- (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.

$$\begin{aligned} -x_1 + 2x_2 - 4x_3 + x_4 &= 1, \\ 3x_1 - x_2 + 2x_3 &= 2, \\ x_1 + 3x_2 - 6x_3 + 2x_4 &= 5. \end{aligned}$$

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

- Solve the following problem:

$$\begin{array}{ll} \max & -x_1 + 2x_2 - 2x_3 \\ & -x_1 + x_2 - 3x_3 \geq 1, \\ \text{subject to} & x_1 + 4x_2 + 4x_3 \leq 3, \\ & 4x_1 + x_2 - 6x_3 \leq 4, \\ & x_1, x_2, x_3 \geq 0. \end{array}$$