CS525 Open-Book Final Exam

Sunday December 20, 1998
10:05 a.m., 2080 Grainger

Answer all questions: 1, 2, 3 & 4. If any question is missing from your sheets, inform the instructor.

Exam can be solved by a total of 4 pivots only.

"Solving" a problem means either finding a solution or determining that no solution exists. In the latter case a justification is needed.

Last Name (Print):____________________

First Name: ____________________

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Do not write anything on this page.

Grades

1. **Question 1:**__________
2. **Question 2:**__________
3. **Question 3:**__________
4. **Question 4:**__________
5. **Total:**_____________

1. (10 points)

$$\begin{array}{ll} \text{minimize} & \frac{1}{2}x_1^2 + x_1x_2 + \frac{3}{2}x_2^2 - 3x_1 - 2x_2 \\ & \begin{array}{rcrcr} x_1 & + & 2x_2 & \geq & 1 \\ -x_1 & + & x_2 & \geq & -5 \\ x_1 & , & x_2 & \geq & 0 \end{array} \end{array}$$

subject to

Answer: $\boxed{x_1 = \qquad x_2 = \qquad \text{Minimum=} \qquad\qquad}$

Problem 1 Sheet

2. (10 points) Solve: $\min_{x \geq 0} \|Ax - b\|_1$ for the system $Ax = b$:

$$\begin{array}{rcrcr} x_1 & - & x_2 & = & 0 \\ x_1 & + & x_2 & = & -5 \end{array}$$

Note that $x \geq 0$.

Answer: $\boxed{x_1 = \qquad x_2 = \qquad \text{Minimum=} \qquad\qquad}$

Problem 2 Sheet

3. (10 points) Solve for all values of the parameter t in the interval $(-\infty, \infty)$. Fill in the summary table below.

$$\begin{array}{ll} \text{minimize} & x_1 + x_2 + t(-x_1 - 2x_2) \\ \text{subject to} & \begin{array}{rcrcr} x_1 & - & x_2 & \geq & -2 \\ x_1 & , & x_2 & \geq & 0 \end{array} \end{array}$$

Paremeter t Range	Minimum Value $z(t)$	Solution Point $x(t)$

Problem 3 Sheet

4. Suppose that $A \in R^{n \times n}$, $c \in R^n$, $A + A' = 0$ and that the following LP is solvable:

$$\min_x c'x \text{ s.t. } Ax \geq -c,\ x \geq 0.$$

What is the minimum value? Justify in a couple of lines by using the dual LP.

Answer: $\boxed{\text{Minimum} = \qquad\qquad}$