CS525 Open-Book Final Exam

Sunday May 10, 1998
2:45 p.m., 5106 Social Sciences

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

Each of Problems 1 and 2 can be completely solved by 2 pivots only.

Last Name (Print):____________________

First Name: ______________________

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Grades

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

1. (10 points)

$$\begin{array}{ll} \text{minimize} & \frac{1}{2}x_1^2 - x_1x_2 + \frac{1}{2}x_2^2 - x_1 + x_2 \\ \text{subject to} & \begin{array}{ccccc} x_1 & - & x_2 & \geq & -1 \\ x_1 & , & x_2 & \geq & 0 \end{array} \end{array}$$

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

Problem 1 Sheet

2. (10 points) Solve: $\min\limits_{x \geq 0} \|Ax - b\|_\infty$ for the system $Ax = b$:

$$\begin{array}{rcrcl} x_1 & + & x_2 & = & 0 \\ x_1 & - & x_2 & = & 2 \end{array}$$

Note that $x \geq 0$.

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

Problem 2 Sheet

3. (10 points) For each claim below, state first whether it is **true** or **false**. Then in no more than two or three sentences justify your answer. An unjustified "True" or "False" answer gets no credit.

(3a)(5 points) Let

$$
\begin{aligned}
\alpha = p'\bar{x} &= \min\{p'x \mid Ax \geq b,\ x \geq 0\},\ A\bar{x} \geq b,\ \bar{x} \geq 0 \\
\beta &= \min\{p'x \mid Bx \geq d,\ x \geq 0\}.
\end{aligned}
$$

If $B \geq A$ and $d \leq b$, then $\alpha < \beta$.

Check one: **True**: ... **False**: ...

Justification:

(3b)(5 points) If z solves

$$\min\{z'(Mz+q) \mid Mz+q \geq 0,\ z \geq 0\},$$

then z solves the LCP:

$$0 \leq z \ \perp \ Mz+q \geq 0$$

Check one: **True**: ... **False**: ...

Justification: