CS525 Open-Book Final Exam
Tuesday, May 14, 1996
12:25 p.m., 594 Van Hise

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

Problems 1 and 2 can be solved by 2 pivots each.

Last Name (Print):_____________________

First Name:__________________________

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Grades

1. Question 1:—
2. Question 2:—
3. Question 3:—
4. Total:——
1. (10 points)

minimize \[ x_1^2 - x_1x_2 + \frac{x_2^2}{2} - 3x_1 + 2x_2 \]
\[-4x_1 + 3x_2 \geq -9 \]
subject to \[ 5x_1 + 2x_2 \geq 1 \]
\[ x_1, x_2 \geq 0 \]
Problem 1 Sheet
2. (10 points) Solve for all values of the parameter $t$ in the interval $(-\infty, \infty)$. Fill in the summary table on the next page with three columns: parameter $t$ range, minimum value $z(t)$ and solution point $x(t)$.

minimize \[ x_1 + x_2 + t\left(\frac{x_1}{2} - x_2\right) \]
\[ x_1 - x_2 \geq -1 \]
subject to \[ x_1 - 2x_2 \geq -4 \]
\[ x_1, \quad x_2 \geq 0 \]
<table>
<thead>
<tr>
<th>Parameter $t$ Range</th>
<th>Minimum Value $z(t)$</th>
<th>Solution Point $x(t)$</th>
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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 $A$ be an $m \times n$ matrix. There exist $x \in \mathbb{R}^n$ and $u \in \mathbb{R}^m$ such that

$$Ax > 0, \ A'u = 0, \ 0 \neq u \geq 0$$

Check one:  \hspace{1cm} True: \hspace{1cm} False:
(3b) (5 points) The LCP

\[ 0 \leq x \perp Mx + q \geq 0 \]

always has a solution when \( M \) is a \( Z \)-matrix.

Check one:  \hspace{1cm} **True:** \hspace{1cm} **False:**