

CS525 Open-Book Final Exam

Tuesday May 11, 1999

7:45 a.m., 168 Noland

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 5 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: _____

Do not write anything else on this page.

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)

$$\begin{aligned} & \text{minimize} && 2x_1^2 + 2x_1x_2 + \frac{1}{2}x_2^2 - x_1 - 2x_2 \\ & \text{subject to} && 2x_1 + 2x_2 \geq 1 \\ & && x_1 - x_2 \geq -3 \\ & && x_1, x_2 \geq 0 \end{aligned}$$

Answer:

$x_1 =$	$x_2 =$	Minimum=
---------	---------	----------

Problem 1 Sheet

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

$$\begin{aligned}x_1 - x_2 &= 2 \\x_1 - 2x_2 &= 4\end{aligned}$$

Note that $x \geq 0$.

Answer:

$x_1 =$	$x_2 =$	Minimum =
---------	---------	-----------

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.

$$\begin{array}{ll}
 \text{minimize} & x_1 + x_2 + t(-x_1) \\
 \text{subject to} & x_1 - x_2 \geq 0 \\
 & -x_1 + 2x_2 \geq -3 \\
 & x_1, x_2 \geq 0
 \end{array}$$

Parameter t Range	Minimum Value $z(t)$	Solution x_1, x_2

Problem 3 Sheet

4. Suppose that x and (x, u) solve the dual quadratic programs:

$$\min_x \frac{1}{2} x' Q x + p' x \quad \text{s.t.} \quad Ax \geq b, x \geq 0,$$

$$\max_{(x,u)} -\frac{1}{2} x' Q x + b'u \quad \text{s.t.} \quad Qx - A'u + p \geq 0, u \geq 0,$$

where Q is symmetric positive semidefinite and $p'x + b'u = 0$. What is the minimum value of the primal objective function?

Answer: Minimum=.....

Justification:

Extra Sheet