CS525 Open-Book Midterm Exam

Thursday, March 18, 1999, 7:30 a.m. 9:25 a.m.
Room 1240 Computer Sciences & Statistics

(i) If a problem has a solution, no solution, or an unbounded objective function, you must clearly state so and justify your claim, for the original given problem.

(ii) Solve each problem using as few pivots as possible. The whole exam can be solved by a total of 4 pivots only.

(iii) Place the final complete answer to each problem after you have solved it on lines immediately below the question.

Last Name (Print):____________________
First Name:____________________

Grades

1. Question 1:________
2. Question 2:________
3. Question 3:________
4. Question 4:________
5. Total:________
1. Solve:

\[
\begin{align*}
  x_1 + 2x_2 + x_3 &= 1 \\
  2x_1 + 5x_2 + x_3 &= 3 \\
  3x_1 - x_2 + 10x_3 &= -5
\end{align*}
\]

Answer: 

---------------------------------------------
2.

minimize \(-2x_1 - x_2 - 3x_3\)

subject to

\[-x_1 + x_2 - x_3 \geq -2\]
\[2x_1 + 3x_3 \geq -3\]
\[-x_1 + 2x_2 - x_3 \geq 0\]
\[x_1, \quad x_2, \quad x_3 \geq 0\]

Answer: 

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3. 

minimize \[ x_1 + 3x_2 + 4x_3 \]

subject to 

\[ 3x_1 + x_2 - x_3 \geq -1 \]
\[ x_1 - x_2 + 2x_3 \geq -1 \]
\[ x_1 + 2x_2 + x_3 \geq 2 \]
\[ x_1, x_2, x_3 \geq 0 \]

Answer: 

\[ \text{[Answer goes here]} \]
4. Solve without changing the number of variables or constraints:

\[
\begin{align*}
\text{minimize} & \quad 2x_1 + x_2 + x_3 + 2x_4 \\
\text{subject to} & \quad 3x_1 + 2x_2 - x_3 + 2x_4 \geq -2 \\
& \quad x_1 + x_2 - x_3 + x_4 = 1 \\
& \quad -3x_1 - x_2 + x_3 - 2x_4 \geq 3 \\
& \quad x_1, x_2, x_4 \geq 0 \\
x_3: \text{free}
\end{align*}
\]

Answer:__________________________________________________________________________
__________________________________________________________________________
Scratch Sheet