CS525 Open-Book Midterm Exam

Thursday, October 22, 1998, 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.

(ii) 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:

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

Answer: ---------------------------------------------------------------
2.

minimize \(-5x_1 + 2x_2 - x_3 + x_4\)

subject to

\[
\begin{align*}
  x_1 &+ x_2 &+ x_3 &- x_4 &\geq -1 \\
-13x_1 &- 3x_2 &+ 2x_3 &+ x_4 &\geq -2 \\
-2x_1 &+ 4x_2 &+ 3x_3 &- x_4 &\geq -3 \\
  x_1 , & & x_2 , & & x_3 , & & x_4 &\geq 0
\end{align*}
\]

Answer: 

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Scratch Sheet
3. Solve without changing the number of variables or constraints:

\[
\begin{align*}
\text{minimize} & \quad 3x_1 - x_2 + 2x_3 \\
\text{subject to} & \quad 3x_1 - x_2 + 2x_3 \geq 1 \\
& \quad -2x_1 + x_2 - x_3 = -1 \\
& \quad 7x_1 - 2x_2 + 3x_3 \geq 1 \\
& \quad x_1, x_2, x_3 \geq 0 \\
& \quad x_2 \text{ free}
\end{align*}
\]

Answer:
4.

minimize \[ x_1 + 2x_2 + x_3 \]

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

Answer:---------------------------------------------------

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Scratch Sheet