

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:

$$\begin{array}{rclcl} x_1 & + & 2x_2 & - & x_3 & = & 1 \\ -x_1 & - & x_2 & & & = & -2 \\ 2x_1 & + & 3x_2 & - & x_3 & = & -1 \end{array}$$

Answer: _____

Scratch Sheet

2.

$$\begin{array}{ll} \text{minimize} & -5x_1 + 2x_2 - x_3 + x_4 \\ \text{subject to} & \begin{array}{l} x_1 + x_2 + x_3 - x_4 \geq -1 \\ -13x_1 - 3x_2 + 2x_3 + x_4 \geq -2 \\ -2x_1 + 4x_2 + 3x_3 - x_4 \geq -3 \\ x_1, x_2, x_3, x_4 \geq 0 \end{array} \end{array}$$

Answer: _____

Scratch Sheet

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

$$\begin{array}{rcll} \text{minimize} & & 3x_1 - x_2 + 2x_3 & \\ & 3x_1 - & x_2 + 2x_3 & \geq 1 \\ & -2x_1 + & x_2 - x_3 & = -1 \\ \text{subject to} & 7x_1 - & 2x_2 + 3x_3 & \geq 1 \\ & x_1 & , & x_3 \geq 0 \\ & & & x_2: \text{free} \end{array}$$

Answer: _____

Scratch Sheet

4.

$$\begin{array}{rllllll} \text{minimize} & & & & x_1 + 2x_2 + x_3 & & \\ & x_1 & + & x_2 & + & x_3 & \geq -2 \\ \text{subject to} & & & - & x_2 & + & x_3 \geq 1 \\ & -x_1 & - & x_2 & - & 2x_3 & \geq -1 \\ & x_1 & , & x_2 & , & x_3 & \geq 0 \end{array}$$

Answer: _____

Scratch Sheet