

TEST ONE, MA 114, DR. JING'S SECTION
11:45-1:00, SEPTEMBER 21, 2006.

Print Your Name:

Signature

1. (20 pts) Solve the following linear system.

$$3x_1 - x_2 + 2x_3 = 14$$

$$x_1 + 2x_2 - 3x_3 = -7$$

$$-x_1 - x_2 + x_3 = 2$$

2. (20 pts) (a) Compute A^{-1} for the matrix (if it exists)

$$A = \begin{bmatrix} 2 & 1 & 0 \\ 1 & 2 & 1 \\ 0 & 1 & 2 \end{bmatrix}$$

3. (20 pts) Consider the following linear system:

$$3x + y - 3z - w = 2$$

$$2x + 2y - 4z + 2w = 4$$

- (a) Find two solutions to the system.
(b) Find all solutions to the system.

4. (20 pts) A nutritionist working for a company providing backpacking equipment is told to produce a package of food sufficient for one backpacker for three days. She must meet certain nutritional requirements and yet keep the weight of the food at a minimum. She is considering a combination of soybeans and rice. Each box of soybeans contains 5 units of protein, 2 units of fat, and 2 units of carbohydrates and weighs 6 ounces. Each box of rice contains 3 units of protein, 1 unit of fat and 3 units of carbohydrates and weighs 6 ounces. A backpacker needs 54 units of protein, 28 units of fat and 35 units of carbohydrates for a three day backpacking trip. If she wants to minimize the weight by designing the composition of soybeans and rice, how can she decide on the number of boxes of soybeans and the number of boxes of rice? (**Only set up the problem, do not try to solve the problem**)

5. (20 pts) Solve the following linear programming problem: Maximize $P = 4x + 3y$ subject to

$$7x + 3y \leq 21$$

$$2x + 5y \leq 10$$

$$x \geq 0, y \geq 0$$