

Math 210 Midterm 3 (Version 1), 2001

Name \_\_\_\_\_

Score:

Problem 1. \_\_\_\_\_

Problem 2. \_\_\_\_\_

Problem 3. \_\_\_\_\_

Problem 4. \_\_\_\_\_

Total: \_\_\_\_\_

**Instruction:** Show all work. No work = no credit, even if you have a correct answer. Calculator and references are not allowed.

1. (a) Production records indicate that the number of defective baseballs produced on a certain production line is related by a linear equation to the total number produced. Suppose this is true. If 10 defective balls are produced in a total of 200 in one day and 20 defective balls are produced in a total of 400 on another day, then how many defective baseballs will be expected on a day when the total production is 500?

(b) A certain car can be rented at the following rate.

40 dollars per day and 0.30 per mile driven.

Find a linear equation which describes the costs (in dollars) of driving  $x$  miles in 1 day under the above rate.

2. Let a matrix A be given as follows.

$$A = \begin{pmatrix} 1 & 0 & 1 \\ 1 & 2 & 3 \\ 0 & 1 & 0 \end{pmatrix}$$

(a) (i) Find the inverse of A by using Gauss elementary row operation.

(ii) Solve the following systems of linear equations using (a).

$$\begin{aligned} x + z &= 7, \\ x + 2y + 3z &= 4, \\ y &= -1. \end{aligned}$$

**Note:** If you don't use (a), then you will not get any credit.

(b) Let  $A$ ,  $B$  and  $C$  be  $2 \times 2$  matrices, and suppose

$$A = \begin{bmatrix} 2 & 1 \\ -3 & 1 \end{bmatrix}$$

$$C = \begin{bmatrix} 2 & 6 \\ 1 & -3 \end{bmatrix}$$

Find  $B$  such that

$$BA = C$$

3.

(a) A manufacturer makes two in-line skate models, the California and the Florida. Both models require two operations in production: finishing the frame and installing and balancing the wheels. These operations require the following amount of time (in minutes).

California: Frame 15, wheels 5, Florida: Frame 10, wheels 20:

There are 120 hours of labor per day available for each job. The profit per California model is 15 dollars, and the profit per Florida model is 18 dollars. How should daily production be scheduled to maximize profit?

(a) Formulate the problem.

(b) Find the maximum of profit.

4. Solve the following linear programming problems

(a) Maximize  $3x - 2y$  subject to

$$x + y \geq 0, \quad x - y \leq 0, \quad -2x + 4y \leq 5.$$

(b) Minimize  $3x - 2y$  subject to

$$y \geq 0, \quad 2x + y \geq 2, \quad 2x - y + 2 \geq 0, \quad x - y \leq 4.$$