Name:

Total/100	Page1/25	Page2/23	Page3/26	Page4/26

MATH 312 Finite Math – **Exam I**

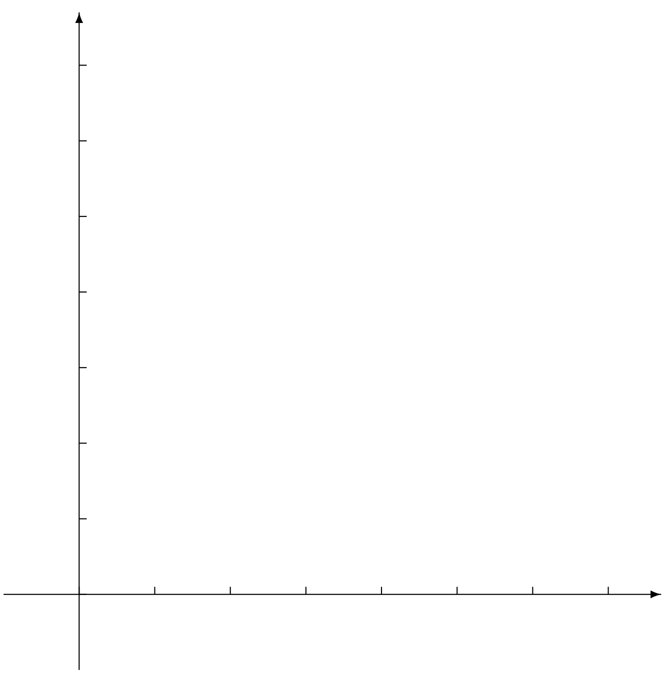
Wednesday, October 1, 2003

Check that that you have all four pages - note that the pages are double-sided.
Show all your work.

---

1. (7 points) Give the equation of the line through the points $(2, 6)$ and $(5, 0)$.

2. (18 points) (a) Put the inequalities in standard form and graph their feasible set. Give the coordinates of the vertices of this region.



$$\begin{aligned} 5x + 2y &\geq 10 \\ 2y + x &\leq 6 \\ x &\geq 0 \\ y &\geq 0. \end{aligned}$$

(b) What is the minimum value taken by $C = 2x - 3y$ subject to the inequalities in (a).

PG SCORE

3. (10 points) Use the Gauss-Jordan method or the formula involving determinants to find the inverse B^{-1} of the matrix

$$B = \begin{bmatrix} 1 & 0 & 1 \\ 2 & 1 & 1 \\ 0 & 3 & -2 \end{bmatrix}.$$

Show each step and check that $B^{-1}B$ is the identity matrix.

4. (13 points) For the matrices

$$B = \begin{bmatrix} 3 & 2 \\ 0 & 5 \end{bmatrix}, \quad C = \begin{bmatrix} 1 & 3 \\ 3 & -2 \\ 4 & 5 \end{bmatrix}, \quad D = \begin{bmatrix} 2 & 0 & 3 \\ 1 & -1 & 2 \end{bmatrix}.$$

calculate the following or say why it is not possible (show some work to get full credit)

(a) BC (b) CD (c) DC

5. (16 points)

$$E = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \qquad A = \begin{bmatrix} 0.8 & 0.4 \\ 0.1 & 0.7 \end{bmatrix}$$

(a) Evaluate $E - A$

(b) Find the inverse matrix $(E - A)^{-1}$

(c) Find the matrix X for which $X - AX = \begin{bmatrix} 10 \\ 20 \end{bmatrix}$.

6. (10 points) Use Gaussian elimination to solve the system of linear equations

$$\begin{aligned} x + 3y + z &= 4 \\ 2x + y - 3z &= -7 \\ 3x + 2y - 3z &= -5. \end{aligned}$$

You will get few points if you don't use the matrix approach. Don't stop before the matrix is in diagonal form even if you see the solution. Check your solution!

7. (10 points) Use Gaussian elimination to solve the system of equations

$$\begin{aligned} x - 2y + z &= 8 \\ 2x - 4y + 4z &= 22 \\ 3x - 6y - 3z &= 6. \end{aligned}$$

Does the system have no solution (explain why), a unique solution (give the solution), or more than one solution (give the general solution).

8. (16 points) Answer the questions for the following linear programming problem. Do Not Solve it! Your final answers should contain only x and y.

A produce dealer ships oranges, grapefruit and avocados. Each truck consists of exactly 200 crates of which at most 150 can be oranges, at most 80 can be grapefruit, and at most 100 can be avocados. There must be at least as many crates of oranges as grapefruit. The profit per crate is \$6 for oranges, \$4 for grapefruit and \$5 for avocados. How many crates of each should be shipped to maximize the profit. Let

$$\begin{aligned} x &= \text{ the number of crates of oranges} \\ y &= \text{ the number of crates of grapefruit.} \end{aligned}$$

(a) Give the objective function

(b) Give the constraints for the problem.