FINITE MATHEMATICS TEST ONE CERRITOS NAME:______________________________

SHOW ALL CALCULATIONS AND SIMPLIFY ANSWERS. SEPT. 19, 2002.

Best EIGHT problems count, for a score out of 100.

(12.5 points) 1. (a) Multiply the matrices. $\begin{pmatrix} 2 & 3 & -2 \\ 3 & -5 & 1 \end{pmatrix}\begin{pmatrix} 4 & 1 \\ 6 & 0 \\ 5 & -2 \end{pmatrix} =$

Show the calculation for the row 1, column 1 entry.

(b) The matrix $\begin{pmatrix} 3 & -5 \\ -4 & 7 \end{pmatrix}$ has **inverse** $\begin{pmatrix} 7 & 5 \\ 4 & 3 \end{pmatrix}$. Use this fact and **matrix multiplication** to solve the system

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

(12.5 points) 2. $B = \begin{pmatrix} 4 & -2 & 3 \\ 7 & -2 & 7 \\ 2 & 1 & 4 \end{pmatrix}$

(a) Show the initial **matrix setup** to find B^{-1} by the **Gauss-Jordan** procedure.

(b) Show the **reduced row echelon form** for the matrix in part (a).
(Can use a calculator.)

(c) Obtain B^{-1} from (b), or by using a calculator. $B^{-1} =$

(12.5 points) 3. Matrix $A = \begin{pmatrix} 2 & 1 & -2 & 5 \\ 3 & 5 & -2 & 14 \\ 2 & -4 & 3 & 15 \end{pmatrix}$.

(a) Describe row operations that would transform the first column of A so that it has a leading 1 at the top, with 0's below.

(b) Perform only the row operations from (a) and show the resulting matrix.

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(12.5 points) 4. (a) Give the **reduced row echelon form** of the matrix, A, in the problem above, using a calculator or row operations.

(b) State the solution to the system
$$\begin{aligned} 2x + y - 2z &= 5 \\ 3x + 5y - 2z &= 14 \\ 2x - 4y + 3z &= 15 \end{aligned}$$

(i) $\begin{pmatrix} 1 & 0 & 5 & 2 \\ 0 & 1 & 2 & 3 \\ 0 & 0 & 0 & 0 \end{pmatrix}$ (ii) $\begin{pmatrix} 1 & 0 & 5 & 0 \\ 0 & 1 & 2 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$.

(12.5 points) 5. Given the **input-output** matrix $\begin{pmatrix} 0.2 & 0.1 & 0 \\ 0 & 0.5 & 0.5 \\ 0.5 & 0.1 & 0.3 \end{pmatrix}$ and the **demand** matrix $\begin{pmatrix} 43 \\ 86 \\ 43 \end{pmatrix}$, find the **production** matrix.

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(12.5 points) 6. (a) Complete the table, with sums at bottom.

x	y	x^2	xy	y^2
2	1			
4	3			
6	4			
7	5			

(b) Find r, the **coefficient of linear correlation**, using calculator or formulas.

(c) Find the **equation** of the **line of best fit** in the form $y = mx + b$ showing the formulas used.

(d) Predict y if $x = 8$.

(12.5 points) 7. We need to ship at least 6000 widgets from our widget factory to help fill an order.
Two types of crates can be used to ship them in.
Crate A holds 13 widgets, requires 17 nails to close it, and costs $22.
Crate B holds 15 widgets, requires 20 nails to close it, and costs $27.
There are only 8100 nails available. We want to ship the widgets at least cost.

(a) Set up **all** appropriate **inequalities** for x crates of type A, and y crates of type B.

(b) Write a formula for the **cost**, C, as a function of x and y.

(12.5 points) 8. Given the **input-output** matrix $\begin{pmatrix} 0.2 & 0.4 & 0.2 \\ 0.3 & 0.5 & 0.5 \\ 0.5 & 0.1 & 0.3 \end{pmatrix}$, find the **ratio** in the form a:b:c, for the production in the three sectors in a **closed model**.

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(12.5 points) 9. (a) **Graph** the system of inequalities at the right. Make a **large** graph, **shade** the feasible set in your graph, and give the coordinates of its **vertices**.

$$x \geq 0, \quad y \geq 0,$$
$$2x + y \leq 12,$$
$$x + y \leq 7,$$
$$2x + 3y \leq 18$$

(b) Find the values of x and y to **maximize** $P = 5x + 7y$ subject to the conditions in part (a).

(c) On the graph for part (a), draw a broken line for $P = 35$.

(100 points total.)

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