Math 166 Ch. 4 Test Name _____
Show all your work if you want to receive credit.

1. Use the method of Gauss Jordan row operations to solve the following

$2x + 3y + z = 6$ $x =$ _____

$x + y + z = 5$ $y =$ _____

$x + 5y + 2z = 9$ $z =$ _____

2. The solution to a word problem in which the variables must be positive integers had the following as its last matrix. Write the solution.

$$\left[\begin{array}{ccc|c} 1 & 0 & 6 & 35 \\ 0 & 1 & -8 & -23 \\ 0 & 0 & 0 & 0 \end{array}\right]$$

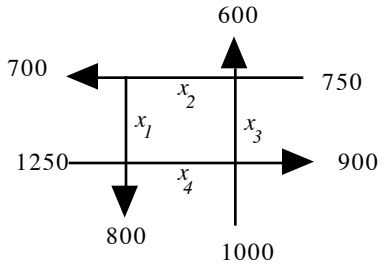
$x =$ _____

$y =$ _____

$z =$ _____

3. You are given the coding matrix $A = \begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix}$, the decoding matrix $A^{-1} = \begin{bmatrix} 3 & -2 \\ 1 & 1 \end{bmatrix}$, and the secret message $\begin{bmatrix} 30 & 16 & 45 & 73 & 35 & 22 \\ 39 & 21 & 54 & 100 & 49 & 26 \end{bmatrix}$. Find the secret message.

4. Write the first matrix for the traffic problem shown in the diagram. Do not solve.



5. The final matrix for a traffic problem in problem (4) is given below. How many cars can drive on x_3?

$$\left[\begin{array}{cccc|c} 1 & 0 & 0 & -1 & -450 \\ 0 & 1 & 0 & -1 & 250 \\ 0 & 0 & 1 & -1 & 100 \\ 0 & 0 & 0 & 0 & 0 \end{array}\right]$$

6. Set up the first matrix for each of the following word problems. Do not solve.

a) As the result of several mergers, stock in four companies has been distributed among the companies. Each row in the table gives the percentage of stock in the four companies that a particular company owns and the net income of each company (in millions of dollars.) Thus company *A* owns 71% of its own stock, 8% of the stock in company *B,* etc. For the purpose of assessing a state tax on corporate income, the taxable income of each company is defined to be its share of its own annual net income plus its share of the taxable income of each of the other companies, a determined by the percentages in the table. What is the taxable income of each company to the nearest thousand dollars?

	Percentage of Stock Owned in Company				
Company	A	B	C	D	Annual Taxes (Million $)
A	71	8	3	7	3.2
B	12	81	11	13	2.6
C	11	9	72	8	3.8
D	6	2	14	72	4.4

b) A commuter airline wants to purchase a fleet of 30 airplanes with a combined seating capacity of 960 passengers. The three types of planes available seat 18, 24, and 42 passengers, respectively. How many of each type of plane should be purchased?

c) A corporation has a taxable income of $2,000,000. At this income level, the federal tax rate is 40%, the state tax rate is 10%, and the local tax rate is 6%. However, it is customary to deduct taxes paid to one agency before computing taxes for the other agencies. Assume that the federal taxes are based on the income that remains after the state and local taxes are deducted, and that the state and local taxes are computed in a similar manner. How much tax is paid to each agency?

7. A company with manufacturing plants in California and Texas has labor-hour and wage requirements given in the tables below. Find the value of the element in row 2, column 1 of *MN* and describe what this number means.

Labor Hours per Calculator

M =	Fabricating	Assembly	Packaging	
	0.15	0.10	0.05	Model A
	0.25	0.20	0.05	Model B

Hourly Wages

N =	California	Texas	
	$15	$12	Fabricating
	$12	$10	Assembly
	$4	$4	Packaging