Name: _____

Applications of Matrices: Solving a System of Linear Equations Using Gauss-Jordan Elimination.

Please show all the steps you use to arrive at the answers. You may write on the back if needed.

1. The Collin Freight Company has an order for three products to be delivered to a destination. Product I requires 10 cubic feet, weighs 10 pounds, and has a value of $100. Product II requires 8 cubic feet, weighs 20 pounds, and has a value of $20. Product III requires 20 cubic feet, weighs 40 pounds, and has a value of $200. If the carrier can carry 6,000 cubic feet, 11,000 pounds, and is insured for $36,900, how many of each product can be carried?

   a. Define the variables of the problem using x, y and z.

   b. Fill out the following table from the information given:

	x	y	z	total
Volume (cu. ft.)				
Weight (lb.)				
Value ($)				

   c. Write the augmented matrix for the system of equations.

   d. Solve the system of equations using Gauss-Jordan Elimination. **Show all row operations on the back of this sheet.**

   e. In at least one complete sentence, answer the question: How many of each product can be carried?

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2. An oil refinery wants to lease a fleet of 24 railroad tank cars with a combined carrying capacity of 520,000 gallons. Tank cars with three different carrying capacities are available: 8,000 gallon tank cars, 16,000 gallon tank cars, and 24,000 gallon tank cars. How many of each type of tank car should be leased?

a. Identify the variables of the problem using x, y and z.

b. Write an equation for the total number of tank cars.

c. Write an equation for the total capacity.

d. Solve the system of equations found in parts (b) and (c) above using Gauss-Jordan Elimination. **Show all row operations on the back of this sheet.**

e. Since x, y, z must be whole numbers ($x, y, z \geq 0$), use what you know about the solutions of the equations to set each variable greater than or equal to zero and solve. This will give you a range of possibilities for z. Since only integer values of z make sense, there are only 4 possible values for z. What are they?

f. List the four solutions (a value for x, y and z for each solution).

g. Suppose that the cost of leasing an 8,000 gallon tank car is $450 per month, a 16,000 gallon tank car is $650 per month, and a 24,000 gallon tank car is $1,150 per month. Write the cost of leasing each type of tank car (in terms of z).

h. Write the equation of the total monthly leasing cost.

i. Determine the total monthly leasing cost for each value of z found in part (e) above.

j. Which of the solutions would produce the minimum monthly leasing cost? State the number of each type of tank car to lease in order to have the minimum monthly leasing cost.

Name: _____

Applications of Matrices: Solving a System of Linear Equations Using Cramer's Rule.

Please show all the steps you use to arrive at the answers. You may write on the back if needed.

3. Two senators want to study school busing in a particular state. Their staff conducts an opinion survey using 600 telephone contacts and 400 house contacts. Senator A has personnel to do 30 telephone and 10 house contacts per hour; Senator B can handle 20 telephone and 20 house contacts per hour. How many hours should be scheduled for each senator to produce exactly the number of contacts needed?

   a. Identify the variables of the problem using x and y.

   b. Fill out the following table from the information given:

	x	y	total
telephone contacts			
house contacts			

   c. Determine the system of equations to be solved.

   d. Solve the system of equations using Cramer's Rule. **You may use the back of this sheet to show your work.**

   e. In at least one complete sentence, answer the question: How many hours should be scheduled for each senator to produce exactly the number of contacts needed?