1) (8 points each) Solve the system using the methods listed below. Write answer as an ordered triple.

a) The Elimination method:

$$\begin{cases} -3x - y + 3z = 25 \\ x - 7y + 5z = 3 \\ 4x - 2y + 3z = 6 \end{cases}$$

① $3x - 21y + 15z = 9$
$-3x - y + 3z = 25$
$-22y + 18z = 34$

② $-4x + 28y - 20z = -12$
$4x - 2y + 3z = 6$
$26y - 17z = -6$

$\times 26$ $\times 22$

③ $-572y + 468z = 884$
$572y - 374z = -132$
$94z = 752$
$z = 8$

④

⑤ $-22y + 18(8) = 34 \Rightarrow y = 5$

$x - 7(5) + 5(8) = 3 \Rightarrow x = -2$

$(-2, 5, 8)$

b) Gauss-Jordan method:

$$\left[\begin{array}{ccc|c} -3 & -1 & 3 & 25 \\ 1 & -7 & 5 & 3 \\ 4 & -2 & 3 & 6 \end{array}\right] \quad R_1 \leftarrow R_2 \quad 3R_1 + R_2 \to R_2 \quad -4R_1 + R_3 \to R_3$$

$$\left[\begin{array}{ccc|c} 1 & -7 & 5 & 3 \\ 0 & -22 & 18 & 34 \\ 0 & 26 & -17 & -6 \end{array}\right] \quad -\tfrac{1}{22}R_2 \to R_2 \quad 7R_2 + R_1 \to R_1 \quad -26R_2 + R_3 \to R_3$$

$$\left[\begin{array}{ccc|c} 1 & 0 & -8/11 & -86/11 \\ 0 & 1 & -9/11 & -17/11 \\ 0 & 0 & 47/11 & 376/11 \end{array}\right] \quad \tfrac{11}{47}R_3 \to R_3 \quad \tfrac{8}{11}R_3 + R_1 \to R_1 \quad \tfrac{9}{11}R_3 + R_2 \to R_2$$

$$\left[\begin{array}{ccc|c} 1 & 0 & 0 & -2 \\ 0 & 1 & 0 & 5 \\ 0 & 0 & 1 & 8 \end{array}\right]$$

$(-2, 5, 8)$

2) (1 point) Verify that you made absolutely sure that your answer to 1a is the same as in 1b by signing your name here Jacob Jones. You will not receive the credit if the work does not support the same answer.

3) (4 points each) The following systems are special cases. Mark your answer as either "no solution" or "infinitely many solutions" and show supporting work. You may use Elimination or Gauss-Jordan to determine the special case.

a) $\begin{cases} 2x + 8y = -4 \\ -6x - 24y = 12 \end{cases}$ $\times 3$

$6x + 24y = -12$
$-6x - 24y = 12$
$0 = 0$

infinitely many sol'n

b) $\begin{cases} 5x + y + 2z = 4 \\ x + 4y - z = 8 \\ 8x - 6y + 6z = 0 \end{cases}$ $\times 2$

① $5x + y + 2z = 4$
$2x + 8y - 2z = 16$
$7x + 9y = 20$ $\times 6$

$6x + 24y - 6z = 48$
$8x - 6y + 6z = 0$
$14x + 18y = 48$

$\times -1$

$-14x - 18y = -40$
$14x + 18y = 48$
$0 = 8$

false! no sol'n

25

4) For the following problem:

In a certain country people own a total of about 353 million fish, cats, and dogs as pets. The number of fish owned is 7 million more than the total number of cats and dogs owned, and 16 million more cats are owned than dogs. How many of each type of pet do people in this country own?

a) (3 points) Name and define your variables for this problem:

x = # of fish owned
y = " " cats "
z = " " dogs "

b) (5 points) Set up **BUT DO NOT SOLVE** a system of equations for this problem:

$$\begin{cases} x+y+z=353 \\ x=7+y+z \\ y=16+z \end{cases}$$

5) (2 points each) For the matrix: $A=\begin{bmatrix} -3 & 6 \\ 0 & 14 \\ 8 & 9 \\ 7 & 12 \end{bmatrix}$, determine…

a) The dimension of matrix A

4 x 2

b) The 3,1 entry

8

6) (4 points each) For the following matrices:

$$A=\begin{bmatrix} 6 & 1 & 7 \end{bmatrix} \qquad B=\begin{bmatrix} 6 & -2 & 4 \\ 1 & 12 & 1 \end{bmatrix} \qquad C=\begin{bmatrix} -1 & 0 & 9 \\ 5 & 7 & 7 \end{bmatrix} \qquad D=\begin{bmatrix} -2 & 8 \\ 5 & 12 \\ 3 & 4 \end{bmatrix}$$

Find the following or explain why they do not exist:

a) $5C-3B$

$\begin{bmatrix} -23 & 6 & 33 \\ 22 & -1 & 32 \end{bmatrix}$

b) AD

$\begin{bmatrix} 14 & 88 \end{bmatrix}$

c) $7B+4D$

not possible! dimensions are not the same.

7) (2 points each) What property must be true to…

a) Add or subtract matrices?

Line

b) Multiply matrices?

Dill

88

8) (6 points each) The manager at CoffeeMe orders 200 lbs of Peru La Florida beans, 150 lbs of Nicaragua Segovia beans, and 175 lbs of the Ethiopia Yirgacheffe beans for one week.

a) Create a 1×3 matrix A that represents the amount of each type of coffee ordered for the week. Be sure to label the rows and columns. Abbreviations are acceptable.

$$A = \begin{matrix} \text{\# of lbs} \end{matrix} \begin{bmatrix} \text{PLF} & \text{NS} & \text{EY} \\ 200 & 150 & 175 \end{bmatrix}$$

b) The following week, the manager increases his order by 20%. Find a matrix B that represents this order. Be sure to label the rows and columns. Abbreviations are acceptable.

multiply by 1.2 = 120%.

$$B = \begin{matrix} \text{\# of lbs} \end{matrix} \begin{bmatrix} \text{PLF} & \text{NS} & \text{EY} \\ 240 & 180 & 210 \end{bmatrix}$$

c) Find the matrix $A+B$ and interpret each value.

$$A + B = \begin{bmatrix} \text{PLF} & \text{NS} & \text{EY} \\ 440 & 320 & 375 \end{bmatrix}$$

Pounds ordered for the two weeks of each type of bean.

9) (6 points each) Megan supplies two coffee shops with homemade cookies: chocolate chip, oatmeal, peanut butter, and dessert rose. The table shows the number of each type of cookie, in dozens, that Megan sold in one week. She spends \$4 for the ingredients for one dozen of chocolate chip, \$3.50 for the ingredients of one dozen of oatmeal cookies, \$3.75 for one dozen peanut butter cookies, and \$5.50 for one dozen of dessert rose cookies.

	CoffeeMe	Little Bird Café
Chocolate Chip	8	15
Oatmeal	6	10
Peanut Butter	5	3.5
Dessert Rose	9	9

a) Write the information of the table as a Create a 4×2 matrix S. Be sure to label the rows and columns. Abbreviations are acceptable.

$$S = \begin{matrix} \text{CC} \\ \text{O} \\ \text{PB} \\ \text{DR} \end{matrix} \begin{bmatrix} \text{CM} & \text{LBC} \\ 8 & 15 \\ 6 & 10 \\ 5 & 3.5 \\ 9 & 9 \end{bmatrix}$$

b) Write a row matrix C that represents the cost per dozen for the ingredients. Be sure to label the rows and columns. Abbreviations are acceptable.

$$C = \text{cost} \begin{bmatrix} \text{CC} & \text{O} & \text{PB} & \text{DR} \\ 4 & 3.5 & 3.75 & 5.50 \end{bmatrix}$$

c) Find the matrix CS and interpret each entry.

$$CS = \text{cost} \begin{bmatrix} \text{CM} & \text{LBC} \\ 121.25 & 157.625 \end{bmatrix}$$

Cost to make the cookies for each coffee shop.

30

10) (8 points part *a*; 3 points part *b*) For the system $\begin{cases} x-y+z=3 \\ x-2y=-5 \\ 5x-6y+3z=0 \end{cases}$ ...

a) Find the inverse of the coefficient matrix algebraically using the Gauss-Jordan Method:

$$\left[\begin{array}{ccc|ccc} 1 & -1 & 1 & 1 & 0 & 0 \\ 1 & -2 & 0 & 0 & 1 & 0 \\ 5 & -6 & 3 & 0 & 0 & 1 \end{array}\right] \begin{array}{l} -R_1+R_2\to R_2 \\ -5R_1+R_3\to R_3 \end{array}$$

$$\left[\begin{array}{ccc|ccc} 1 & -1 & 1 & 1 & 0 & 0 \\ 0 & -1 & -1 & -1 & 1 & 0 \\ 0 & -1 & -2 & -5 & 0 & 1 \end{array}\right] \begin{array}{l} -R_2\to R_2 \\ R_2+R_1\to R_1 \\ R_2+R_3\to R_3 \end{array}$$

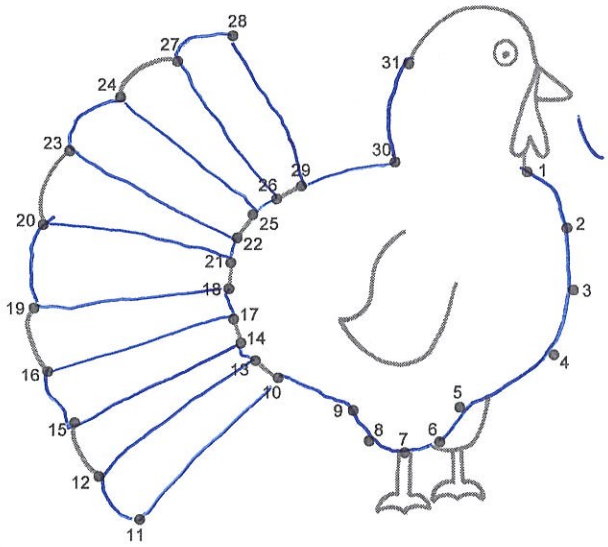
$$\left[\begin{array}{ccc|ccc} 1 & 0 & 2 & 2 & -1 & 0 \\ 0 & 1 & 1 & 1 & -1 & 0 \\ 0 & 0 & -1 & -4 & -1 & 1 \end{array}\right] \begin{array}{l} -R_3\to R_3 \\ -2R_3+R_1\to R_1 \\ -R_3+R_2\to R_2 \end{array}$$

$$\left[\begin{array}{ccc|ccc} 1 & 0 & 0 & -6 & -3 & 2 \\ 0 & 1 & 0 & -3 & -2 & 1 \\ 0 & 0 & 1 & 4 & 1 & -1 \end{array}\right] \text{ inverse!}$$

b) Solve the system using the matrix inverse from part *a*. Write answer as an ordered triple.

$$\begin{bmatrix} -6 & -3 & 2 \\ -3 & -2 & 1 \\ 4 & 1 & -1 \end{bmatrix} \begin{bmatrix} 3 \\ -5 \\ 0 \end{bmatrix} = \begin{bmatrix} -3 \\ 1 \\ 7 \end{bmatrix}$$

$(-3, 1, 7)$



my name is EC

+11