Exam

Name_____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Provide an appropriate response.

1) Which choice best describes the following matrix? 1) _____

$$\begin{bmatrix} 24 \\ 25 \\ 20 \\ 17 \\ 18 \end{bmatrix}$$

A) Column matrix B) Row matrix C) Square matrix D) 1 × 5 matrix

Answer: A

Explanation: A)
B)
C)
D)

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

2) Let $A = \begin{bmatrix} c & d \\ a & b \end{bmatrix}$ 2) _____

Find A^{-1}.

Answer: $A^{-1} = \begin{bmatrix} \frac{-b}{ad - bc} & \frac{d}{ad - bc} \\ \frac{a}{ad - bc} & \frac{-c}{ad - bc} \end{bmatrix}$

Explanation:

3) Can non-square matrices have inverses? Why or why not? 3) _____

Answer: No. Only square matrices can have inverses, because both $A^{-1}A$ and AA^{-1} must exist and be equal to I. (Explanations may vary.)

Explanation:

4) Describe the proper form for the system to be in before the Gauss-Jordan method can be used. 4) _____

Answer: The terms with variables should be on the left and the constants on the right in each equation, with the variables in the same order in each equation.

Explanation:

5) Does a matrix with a column of all zeros have an inverse? Why or why not? 5) _____

Answer: No. Assume that the matrix had an inverse. In multiplying the row of zeros by the corresponding elements in the columns of the "inverse," you would get all 0's. It would be impossible to multiply the two matrices and get the identity matrix, which has all 1's on the diagonal. (Explanations may vary.)

Explanation:

6) If a variable is expressed in terms of another variable, what is the other variable called? 6) _____

Answer: A parameter
Explanation:

7) Is this a square matrix? Why or why not? 7) _____

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

Answer: No. The number of rows (3) is not the same as the number of columns (4).
Explanation:

8) The _____ property does not apply to matrix multiplication. 8) _____

Answer: commutative
Explanation:

9) An m × n zero matrix serves as an m × n _____. 9) _____

Answer: additive identity
Explanation:

10) Let $A = \begin{bmatrix} c & d \\ a & b \end{bmatrix}$. Show that AI = A. 10) _____

Answer: $AI = \begin{bmatrix} c & d \\ a & b \end{bmatrix} \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

$$= \begin{bmatrix} c(1) + d(0) & c(0) + d(1) \\ a(1) + b(0) & a(0) + b(1) \end{bmatrix}$$

$$= \begin{bmatrix} c & d \\ a & b \end{bmatrix} = A$$

Explanation:

11) Describe in your own words what $-1R_1 + R_3 \rightarrow R_3$ means. 11) _____

Answer: Each element in row 1 is multiplied by -1 and added to the corresponding element in row 3. The result is the new row 3. All other rows (including row 1) are left unchanged. (Explanations may vary.)
Explanation:

12) How many solutions are there to a dependent system? 12) _____

Answer: Infinitely many solutions
Explanation:

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Use a graphing calculator to solve the system of equations. Round your solution to one decimal place.

13) $2.7x - 0.2y - 5.0z = 2.6$
$5.6x + 4.6y - 0.5z = -4.1$
$3.4x - 1.3y + 1.6z = 10.5$ 13) _____

A) (1.7, -2.9, 0.5) B) (8.6, -14.6, 2.6) C) (6.9, -11.7, 2.1) D) (3.4, -5.9, 1.1)

Answer: A
Explanation: A)
B)
C)
D)

Use the Gauss-Jordan method to solve the system of equations.

14) $8w + 8x - 6y - 2z = -30$
$7w + 6x - 9y - 2z = -38$
$8w + 8x + 7y + 3z = 17$
$-6w - 2x + 8y + 8z = 18$ 14) _____

A) (-1, 4, -5, 2) B) (2, 3, -4, -2) C) (2, -3, 4, -1) D) No solution

Answer: C
Explanation: A)
B)
C)
D)

Use the echelon method to solve the system.

15) $\frac{x}{5} + \frac{y}{5} = 1$ 15) _____

$\frac{x}{5} - \frac{y}{5} = -\frac{7}{5}$

A) (1, 7) B) (-2, 7) C) (-1, 6) D) No solution

Answer: C
Explanation: A)
B)
C)
D)

Solve the problem.

16) Janet is planning to visit Arizona, New Mexico, and California on a 20-day vacation. If she plans to spend as much time in New Mexico as she does in the other two states combined, how can she allot her time in the three states? (Let x denote the number of days in Arizona, y the number of days in New Mexico, and z the number of days in California. Let z be the parameter.) 16) _____

A) $x = 10, y = 10 - z, 0 \le z \le 10$ B) $x = 10, y = z - 10, 0 \le z \le 10$
C) $x = z - 10, y = 10, 0 \le z \le 10$ D) $x = 10 - z, y = 10, 0 \le z \le 10$

Answer: D
Explanation: A)
B)
C)
D)

Use a graphing calculator to solve the system of equations. Round your solution to one decimal place.

17) $1.5x - 0.4y + 1.6z = 2.4$
$4.5x - 7.0y - 0.4z = -4.0$
$3.8x + 2.4y + 2.0z = 8.6$ 17) _____

A) $(0.8, 0.9, 0.6)$ B) $(1.1, 1.2, 0.8)$ C) $(0.5, 0.6, 0.4)$ D) $(0.3, 0.3, 0.2)$

Answer: B
Explanation: A)
B)
C)
D)

Use the Gauss-Jordan method to solve the system of equations.

18) $-2x - 8y = 6$
$-4x - 16y = 2$ 18) _____

A) $(2, 2)$ B) $\left(-\frac{4}{3}x - \frac{1}{3}y, y\right)$ C) $(6, 2)$ D) No solution

Answer: D
Explanation: A)
B)
C)
D)

19) $3x - 2y = -3$
$9x - 6y = -9$ 19) _____

A) $(1, 3)$ B) $\left(-1 - \frac{2}{3}y, y\right)$ C) $\left(-1 + \frac{2}{3}y, y\right)$ D) No solution

Answer: C
Explanation: A)
B)
C)
D)

Perform the indicated operation, where possible.

20) $\begin{bmatrix} 3 \\ -1 \\ -4 \end{bmatrix} + \begin{bmatrix} -5 \\ 2 \\ 8 \end{bmatrix}$ 20) _____

A) $\begin{bmatrix} 2 \\ 4 \\ 5 \end{bmatrix}$ B) $\begin{bmatrix} -2 & 1 & 4 \end{bmatrix}$ C) $\begin{bmatrix} -2 \\ 1 \\ 4 \end{bmatrix}$ D) $\begin{bmatrix} 3 & -5 \\ -1 & 2 \\ -4 & 8 \end{bmatrix}$

Answer: C
Explanation: A)
B)
C)
D)

Use the Gauss-Jordan method to solve the system of equations.

21) $5x - y + z = 8$
$7x + y + z = 6$
$12x + 2z = 14$ 21) _____

A) $\left\{\frac{-z+7}{6}, \frac{z-13}{6}, z\right\}$ B) $\left\{\frac{z+7}{6}, \frac{-z-13}{6}, z\right\}$
C) $\left\{\frac{-z+7}{6}, \frac{z+13}{6}, z\right\}$ D) $\left\{\frac{z-7}{6}, \frac{-z-13}{6}, z\right\}$

Answer: A
Explanation: A)
B)
C)
D)

Decide whether the matrices are inverses of each other. (Check to see if their product is the identity matrix I.)

22) $\begin{bmatrix} -5 & -1 \\ 6 & 0 \end{bmatrix}$ and $\begin{bmatrix} 0 & \frac{1}{6} \\ -1 & \frac{5}{6} \end{bmatrix}$ 22) _____

A) Yes B) No

Answer: B
Explanation: A)
B)

Use the echelon method to solve the system.

23) $\frac{3x}{2} - \frac{y}{3} = -18$
$\frac{3x}{4} + \frac{2y}{9} = -9$ 23) _____

A) (0, -12) B) (-12, 0) C) (12, 0) D) (0, 12)

Answer: B
Explanation: A)
B)
C)
D)

Solve the system of equations by using the inverse of the coefficient matrix if it exists and by the echelon method if the inverse doesn't exist.

24) $-3x + 9y = 9$
$3x + 2y = 13$ 24) _____

A) (3, 2) B) (-3, -2) C) (-2, -3) D) (2, 3)

Answer: A
Explanation: A)
B)
C)
D)

Solve the problem.

25) A company makes three chocolate candies: cherry, almond, and raisin. Matrix A gives the amount of ingredients in one batch. Matrix B gives the costs of ingredients from suppliers J and K. What is the cost of 100 batches of each candy using ingredients from supplier J? 25) _____

$$A = \begin{matrix} \text{sugar} & \text{choc} & \text{milk} \\ \begin{bmatrix} 6 & 8 & 1 \\ 6 & 4 & 1 \\ 5 & 7 & 1 \end{bmatrix} \end{matrix} \begin{matrix} \\ \text{cherry} \\ \text{almond} \\ \text{raisin} \end{matrix}$$

$$B = \begin{matrix} \text{J} & \text{K} \\ \begin{bmatrix} 4 & 3 \\ 4 & 5 \\ 2 & 2 \end{bmatrix} \end{matrix} \begin{matrix} \\ \text{sugar} \\ \text{choc} \\ \text{milk} \end{matrix}$$

A) $12,000 B) $6000 C) $15,000 D) $15,200

Answer: C

Explanation: A)
B)
C)
D)

26) A company makes three chocolate candies: cherry, almond, and raisin. Matrix A gives the amount of ingredients in one batch. Matrix B gives the costs of ingredients from suppliers X and Y. What is the cost of 100 batches of each candy using ingredients from supplier X? 26) _____

$$A = \begin{matrix} \text{sugar} & \text{choc} & \text{milk} \\ \begin{bmatrix} 4 & 6 & 1 \\ 5 & 3 & 1 \\ 3 & 3 & 1 \end{bmatrix} \end{matrix} \begin{matrix} \\ \text{cherry} \\ \text{almond} \\ \text{raisin} \end{matrix}$$

$$B = \begin{matrix} \text{X} & \text{Y} \\ \begin{bmatrix} 3 & 2 \\ 3 & 4 \\ 2 & 2 \end{bmatrix} \end{matrix} \begin{matrix} \\ \text{sugar} \\ \text{choc} \\ \text{milk} \end{matrix}$$

A) $4800 B) $7800 C) $3300 D) $6600

Answer: B

Explanation: A)
B)
C)
D)

Find the values of the variables in the equation.

27) $\begin{bmatrix} t-1 & -4 & 0 \\ -3 & 4 & 3 \end{bmatrix} = \begin{bmatrix} -4 & -4 & 0 \\ -3 & x-8 & 3 \end{bmatrix}$ 27) _____

A) $t = -3, x = 12$ B) $t = -4, x = 4$ C) $t = -3, x = -4$ D) $t = -4, x = -4$

Answer: A

Explanation: A)
B)
C)
D)

Decide whether the matrices are inverses of each other. (Check to see if their product is the identity matrix I.)

28) $\begin{bmatrix} -2 & 4 \\ 4 & -4 \end{bmatrix}$ and $\begin{bmatrix} \frac{1}{2} & \frac{1}{4} \\ \frac{1}{2} & \frac{1}{4} \end{bmatrix}$ 28) _____

A) Yes B) No

Answer: B

Explanation: A)
B)

Find the matrix product, if possible.

29) $\begin{bmatrix} 0 & -2 \\ 5 & 3 \end{bmatrix}\begin{bmatrix} -2 & 0 \\ -1 & 1 \end{bmatrix}$ 29) _____

A) $\begin{bmatrix} -2 & 2 \\ -7 & -13 \end{bmatrix}$ B) $\begin{bmatrix} 0 & 4 \\ -5 & 3 \end{bmatrix}$ C) $\begin{bmatrix} 2 & -2 \\ -13 & 3 \end{bmatrix}$ D) $\begin{bmatrix} -10 & -6 \\ 5 & 5 \end{bmatrix}$

Answer: C

Explanation: A)
B)
C)
D)

Use the Gauss-Jordan method to solve the system of equations.

30) $x + y + z = 7$
$x - y + 2z = 7$
$2x + 3z = 14$ 30) _____

A) $\left(\frac{-3z + 14}{2}, \frac{z}{2}, z\right)$ B) $\left(\frac{-3z - 14}{2}, \frac{z}{2}, z\right)$ C) $\left(\frac{-3z + 14}{2}, 2z, z\right)$ D) $\left(\frac{3z + 14}{2}, \frac{z}{2}, z\right)$

Answer: A

Explanation: A)
B)
C)
D)

Perform the indicated operation, where possible.

31) $\begin{bmatrix} -9 & 1 \\ 2 & 5 \end{bmatrix} + \begin{bmatrix} 6 & 2 \\ 6 & 3 \end{bmatrix}$ 31) _____

A) $\begin{bmatrix} 3 & 4 \\ 4 & 8 \end{bmatrix}$ B) $\begin{bmatrix} -3 & 3 \\ 8 & 8 \end{bmatrix}$ C) $\begin{bmatrix} -3 & -7 \\ -3 & -6 \end{bmatrix}$ D) Not possible

Answer: B

Explanation: A)
B)
C)
D)

Find the value.

32) Let $C = \begin{bmatrix} 6 \\ -2 \\ 12 \end{bmatrix}$; $\frac{1}{2}C$ 32) _____

A) $\begin{bmatrix} 3 \\ -2 \\ 12 \end{bmatrix}$ B) $\begin{bmatrix} 6 \\ -1 \\ 12 \end{bmatrix}$ C) $\begin{bmatrix} 3 \\ -1 \\ 6 \end{bmatrix}$ D) $\begin{bmatrix} 12 \\ -4 \\ 24 \end{bmatrix}$

Answer: C

Explanation: A)
B)
C)
D)

Solve the problem.

33) A basketball fieldhouse seats 15,000. Courtside seats cost $10, endzone seats cost $6, and balcony seats cost $4. The total revenue for a sellout is $82,000. If half the courtside seats, half the balcony seats, and all the endzone seats are sold; then the total revenue is $47,000. How many of each type of seat are there? 33) _____

A) 4000 courtside, 3000 endzone, 8000 balcony
B) 3000 courtside, 4000 endzone, 8000 balcony
C) 3000 courtside, 2000 endzone, 10,000 balcony
D) 3200 courtside, 1800 endzone, 10,000 balcony

Answer: C

Explanation: A)
B)
C)
D)

Decide whether the matrices are inverses of each other. (Check to see if their product is the identity matrix I.)

34) $\begin{bmatrix} 9 & -2 \\ 7 & -2 \end{bmatrix}$ and $\begin{bmatrix} \frac{1}{2} & \frac{1}{2} \\ -\frac{7}{4} & -\frac{9}{4} \end{bmatrix}$ 34) _____

A) Yes B) No

Answer: B

Explanation: A)
B)

Use a graphing calculator to solve the system of equations. Round your solution to one decimal place.

35) $\begin{aligned} 1.5x + 3.1y - 2.3z + 0.6w &= 2.7 \\ 6.1x - 0.5z - 3.4w &= 0.8 \\ 11.5y - 2.2w &= 0 \\ 4.0x + 3.0y - 2.1z &= 9 \end{aligned}$ 35) _____

A) (7.9, 2.4, 9.0, 12.3) B) (3.6, 1.1, 4.1, 5.6)
C) (3.2, 1.0, 3.7, 5.0) D) (4.3, 1.3, 4.9, 6.7)

Answer: B

Explanation: A)
B)
C)
D)

Write the system of equations associated with the augmented matrix.

36) $\left[\begin{array}{cc|c} 1 & 0 & 2 \\ 0 & 1 & -3 \end{array}\right]$ 36) _____

A) x = 1, y = 1 B) x = -2, y = 3 C) x = 0, y = 0 D) x = 2, y = -3

Answer: D

Explanation: A)
B)
C)
D)

Find the matrix product, if possible.

37) $\left[\begin{array}{cc} 1 & 0 \\ 0 & 2 \end{array}\right]\left[\begin{array}{ccc} 5 & 2 & -2 \\ 2 & -2 & 2 \end{array}\right]$ 37) _____

A) $\left[\begin{array}{ccc} 5 & 0 & 0 \\ 0 & -4 & 4 \end{array}\right]$ B) $\left[\begin{array}{ccc} 4 & -4 & 4 \\ 5 & 2 & -2 \end{array}\right]$ C) $\left[\begin{array}{ccc} 5 & 2 & -2 \\ 4 & -4 & 4 \end{array}\right]$ D) Does not exist

Answer: C

Explanation: A)
B)
C)
D)

Use the echelon method to solve the system of two equations in two unknowns.

38) 4x - 2y = 9
20x - 10y = 27 38) _____

A) $\left(\frac{1}{2}y + \frac{9}{4}, y\right)$ B) $\left(1, -\frac{5}{2}\right)$ C) (1, 0) D) No solution

Answer: D

Explanation: A)
B)
C)
D)

Solve the problem.

39) The matrices give points and rebounds for five starting players in two games. Find the matrix that gives the totals. 39) _____

$$F = \begin{array}{c} \text{Points} \quad \text{Rebounds} \\ \begin{bmatrix} 21 & 3 \\ 16 & 5 \\ 8 & 12 \\ 3 & 11 \\ 10 & 2 \end{bmatrix} \end{array}$$

$$S = \begin{array}{c} \text{Points} \quad \text{Rebounds} \\ \begin{bmatrix} 18 & 4 \\ 15 & 3 \\ 12 & 9 \\ 4 & 10 \\ 10 & 3 \end{bmatrix} \end{array}$$

A) $\begin{bmatrix} 39 & 7 \\ 31 & 8 \\ 20 & 21 \\ 7 & 21 \\ 20 & 5 \end{bmatrix}$ B) $\begin{bmatrix} 7 & 39 \\ 31 & 8 \\ 21 & 20 \\ 21 & 7 \\ 5 & 20 \end{bmatrix}$ C) $\begin{bmatrix} 5 & 62 \end{bmatrix}$ D) $\begin{bmatrix} 62 & 5 \end{bmatrix}$

Answer: A

Explanation: A)
B)
C)
D)

Use the indicated row operation to change the matrix.

40) Replace R_2 by $\frac{1}{3}R_1 + \frac{1}{2}R_2$. 40) _____

$$\left[\begin{array}{cc|c} 3 & 0 & 15 \\ -2 & 4 & 12 \end{array}\right]$$

A) $\left[\begin{array}{cc|c} 3 & 0 & 15 \\ 0 & 2 & 11 \end{array}\right]$ B) $\left[\begin{array}{cc|c} 3 & 0 & 15 \\ -1 & 2 & 6 \end{array}\right]$ C) $\left[\begin{array}{cc|c} 3 & 0 & 15 \\ 1 & 4 & 27 \end{array}\right]$ D) $\left[\begin{array}{cc|c} 3 & 0 & 15 \\ 0 & 0 & 11 \end{array}\right]$

Answer: A

Explanation: A)
B)
C)
D)

Solve the system of equations. Let z be the parameter.

41) $-3x + y + 6z = -7$
$7x + 3y + 4z = -14$ 41) _____

A) $(7 + 14z, -91 + 7z, z)$

B) $\left(\frac{7}{16} + \frac{7}{8}z, -\frac{91}{16} - \frac{27}{8}z, z\right)$

C) $\left(\frac{7}{16} + \frac{7}{8}z, -7 + 6z, z\right)$

D) $\left(\frac{7}{16} + \frac{7}{8}z, -7 - 6z, z\right)$

Answer: B

Explanation: A)
B)
C)
D)

Provide an appropriate response.

42) What are the elements of the third row of the following matrix? 42) _____

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

A) 1, -5, 2, 6 B) -2, 1, 3, 4 C) 3, 4, 2 D) -2, -1, 2

Answer: A

Explanation: A)
B)
C)
D)

Solve the system of equations by using the inverse of the coefficient matrix.

43) $x - y + 3z = 5$
$2x + z = 1$
$x + 4y + z = -7$ 43) _____

A) $(1, -2, 0)$

B) $(1, 0, -2)$

C) $(0, -2, 1)$

D) No inverse, no solution for system

Answer: C

Explanation: A)
B)
C)
D)

Find the matrix product, if possible.

44) $\begin{bmatrix} 3 & -1 \\ 3 & 0 \end{bmatrix}\begin{bmatrix} 0 & -1 \\ 3 & 6 \end{bmatrix}$ 44) _____

A) $\begin{bmatrix} 0 & 1 \\ 9 & 0 \end{bmatrix}$ B) $\begin{bmatrix} -3 & -9 \\ 0 & -3 \end{bmatrix}$ C) $\begin{bmatrix} -3 & 0 \\ 27 & -3 \end{bmatrix}$ D) $\begin{bmatrix} -9 & -3 \\ -3 & 0 \end{bmatrix}$

Answer: B

Explanation: A)
B)
C)
D)

Solve the problem.

45) Carney and Dobler sell auto and hazard insurance. Their sales, in dollars, for the months of July and August are given in the following matrices. 45) _____

	Auto	Hazard	
July:	22,000	45,000	Carney
	19,000	27,000	Dobler

August:	25,000	44,000	Carney
	14,000	21,000	Dobler

Find a matrix that gives the increase (decrease) in sales by each salesman for each type of insurance from July to August.

A) $\begin{bmatrix} -3000 & 1000 \\ 5000 & 6000 \end{bmatrix}$ B) $\begin{bmatrix} -8000 & 7000 \end{bmatrix}$ C) $\begin{bmatrix} 3000 & -1000 \\ -5000 & -6000 \end{bmatrix}$ D) $\begin{bmatrix} 8000 & -7000 \end{bmatrix}$

Answer: C

Explanation: A)
B)
C)
D)

The sizes of two matrices A and B are given. Find the sizes of the product AB and the product BA, whenever these products exist.

46) A is 2 × 1, and B is 1 × 1. 46) _____

A) AB does not exist; 1 × 2
B) 2 × 2; 1 × 1
C) 1 × 2; 1 × 1
D) 2 × 1; BA does not exist.

Answer: D

Explanation: A)
B)
C)
D)

Use a graphing calculator to find the matrix product and/or sum.

47) Find AB + AC. 47) _____

$$A = \begin{bmatrix} 17 & -14 & 18 & 18 \\ 30 & 5 & -7 & 2 \\ 11 & 3 & -2 & 1 \\ -5 & 32 & 5 & 10 \end{bmatrix} \quad B = \begin{bmatrix} 5 & 17 & 12 \\ 7 & 6 & -4 \\ -12 & -9 & 15 \\ 3 & -2 & -14 \end{bmatrix} \quad C = \begin{bmatrix} 7 & -4 & 3 \\ -16 & -19 & 20 \\ -6 & -15 & -8 \\ 5 & 16 & 17 \end{bmatrix}$$

A) $\begin{bmatrix} 150 & 3 & 281 \\ 457 & 521 & 487 \\ 97 & 206 & 88 \\ 174 & -461 & 502 \end{bmatrix}$

B) $\begin{bmatrix} -168 & 3 & 281 \\ 259 & 580 & 297 \\ 97 & 206 & 88 \\ 174 & 58 & -28 \end{bmatrix}$

C) $\begin{bmatrix} 150 & 223 & 211 \\ 457 & 521 & 487 \\ 149 & 166 & 202 \\ -358 & -461 & 502 \end{bmatrix}$

D) Does not exist

Answer: C

Explanation: A)
B)
C)
D)

Find the matrix product, if possible.

48) $\begin{bmatrix} -1 & 3 \\ 5 & 4 \end{bmatrix} \begin{bmatrix} 0 & -2 & 4 \\ 1 & -3 & 2 \end{bmatrix}$ 48) _____

A) $\begin{bmatrix} 3 & -7 & 2 \\ 4 & -22 & 28 \end{bmatrix}$

B) $\begin{bmatrix} 3 & 4 & -7 \\ -22 & 2 & 28 \end{bmatrix}$

C) $\begin{bmatrix} 0 & -6 \\ 12 & 5 \\ -12 & 8 \end{bmatrix}$

D) Does not exist

Answer: A

Explanation: A)
B)
C)
D)

Find the inverse, if it exists, for the matrix.

49) $\begin{bmatrix} 2 & -1 & 0 \\ 3 & -2 & 0 \\ -2 & 3 & 1 \end{bmatrix}$ 49) _____

A) $\begin{bmatrix} 2 & -1 & 0 \\ 3 & 2 & 0 \\ -5 & 4 & 1 \end{bmatrix}$

B) $\begin{bmatrix} 1 & -1 & 0 \\ 3 & -2 & 1 \\ -5 & 4 & -1 \end{bmatrix}$

C) $\begin{bmatrix} 2 & -1 & 0 \\ 3 & -2 & 0 \\ -5 & 4 & -1 \end{bmatrix}$

D) $\begin{bmatrix} 2 & -1 & 0 \\ 3 & -2 & 0 \\ -5 & 4 & 1 \end{bmatrix}$

Answer: D

Explanation: A)
B)
C)
D)

Write a matrix to display the information.

50) A bakery sells three types of cakes. Cake I requires 2 cups of flour, 2 cups of sugar, and 2 eggs. Cake II requires 4 cups of flour, 1 cup of sugar, and 1 egg. Cake III requires 2 cups of flour, 2 cups of sugar, and 3 eggs. Make a 3 × 3 matrix showing the required ingredients for each cake. Assign the cakes to the rows and the ingredients to the columns. 50) _____

A) $\begin{bmatrix} 2 & 1 & 3 \\ 2 & 1 & 2 \\ 2 & 4 & 2 \end{bmatrix}$ B) $\begin{bmatrix} 2 & 4 & 2 \\ 2 & 1 & 2 \\ 2 & 1 & 3 \end{bmatrix}$ C) $\begin{bmatrix} 2 & 2 & 2 \\ 4 & 1 & 1 \\ 2 & 2 & 3 \end{bmatrix}$ D) $\begin{bmatrix} 2 & 2 & 3 \\ 1 & 1 & 4 \\ 2 & 2 & 2 \end{bmatrix}$

Answer: C

Explanation: A)
B)
C)
D)

Find the ratios of products A, B, and C using a closed model.

51) 51) _____

	A	B	C
A	0.3	0.3	0.8
B	0.5	0.6	0
C	0.2	0.1	0.2

A) 32: 40: 13 B) 8: 10: 3 C) 8: 10: 40 D) 8: 13: 32

Answer: A

Explanation: A)
B)
C)
D)

Find the inverse, if it exists, for the matrix.

52) $\begin{bmatrix} 8 & 2 \\ -7 & 1 \end{bmatrix}$ 52) _____

A) $\begin{bmatrix} 1 & -2 \\ 7 & 8 \end{bmatrix}$ B) $\begin{bmatrix} \frac{1}{23} & \frac{2}{23} \\ -\frac{7}{23} & \frac{8}{23} \end{bmatrix}$ C) $\begin{bmatrix} \frac{1}{23} & -\frac{2}{23} \\ \frac{7}{23} & \frac{8}{23} \end{bmatrix}$ D) No inverse

Answer: D

Explanation: A)
B)
C)
D)

The sizes of two matrices A and B are given. Find the sizes of the product AB and the product BA, whenever these products exist.

53) A is 4 × 2, and B is 4 × 2. 53) _____

A) 2 × 4; 4 × 2 B) AB does not exist; BA does not exist.
C) 4 × 4; 2 × 2 D) 4 × 2; 2 × 4

Answer: B

Explanation: A)
B)
C)
D)

Decide whether the matrices are inverses of each other. (Check to see if their product is the identity matrix I.)

54) $\begin{bmatrix} -5 & 1 \\ -7 & 1 \end{bmatrix}$ and $\begin{bmatrix} \frac{1}{2} & -\frac{1}{2} \\ \frac{7}{2} & -\frac{5}{2} \end{bmatrix}$ 54) _____

A) Yes B) No

Answer: A

Explanation: A)

B)

Solve the system of equations by using the inverse of the coefficient matrix if it exists and by the echelon method if the inverse doesn't exist.

55) $-2x - 6y = -2$
$2x - y = -5$ 55) _____

A) (-1, 2) B) (1, -2) C) (-2, 1) D) (2, -1)

Answer: C

Explanation: A)

B)

C)

D)

Solve the problem.

56) An investor has $400,000 to invest in stocks, bonds, and commodities. If he plans to put three times as much into stocks as in bonds, how can he distribute his money among the three types of investments? (Let x denote the amount put into stocks, y the amount put into bonds, and z the amount put into commodities. Let all amounts be in dollars, and let z be the parameter.) 56) _____

A) $x = 300{,}000 - z/2$, $y = 100{,}000 - z/2$, $0 \le z \le 400{,}000$

B) $x = 100{,}000 - z/2$, $y = 300{,}000 - z/2$, $0 \le z \le 400{,}000$

C) $x = 300{,}000 - 3z/4$, $y = 100{,}000 - z/4$, $0 \le z \le 400{,}000$

D) $x = 100{,}000 - 3z/4$, $y = 300{,}000 - z/4$, $0 \le z \le 400{,}000$

Answer: C

Explanation: A)

B)

C)

D)

Find the inverse, if it exists, for the matrix.

57) $A = \begin{bmatrix} 2 & -3 & 0 & 2 \\ 6 & -6 & 0 & 4 \\ 6 & -12 & 0 & 6 \\ 0 & 0 & -2 & 0 \end{bmatrix}$ 57) _____

A) $\begin{bmatrix} \frac{1}{2} & -\frac{1}{3} & 0 & \frac{1}{2} \\ \frac{1}{6} & -\frac{1}{6} & 0 & \frac{1}{4} \\ \frac{1}{6} & -\frac{1}{12} & 0 & \frac{1}{6} \\ 0 & 0 & -\frac{1}{2} & 0 \end{bmatrix}$

B) $\begin{bmatrix} -1 & 1 & 0 & 3 \\ \frac{1}{2} & 0 & 0 & -\frac{1}{2} \\ 0 & -\frac{1}{3} & 0 & -\frac{1}{2} \\ 0 & 0 & -\frac{1}{2} & 0 \end{bmatrix}$

C) $\begin{bmatrix} -1 & \frac{1}{2} & 0 & 0 \\ 1 & 0 & -\frac{1}{3} & 0 \\ 0 & 0 & 0 & -\frac{1}{2} \\ 3 & -\frac{1}{2} & -\frac{1}{2} & 0 \end{bmatrix}$

D) No inverse

Answer: C

Explanation: A)
B)
C)
D)

Solve the problem.

58) Anne and Nancy use a metal alloy that is 25.75% copper to make jewelry. How many ounces of a 19% alloy must be mixed with a 28% alloy to form 92 ounces of the desired alloy? 58) _____

A) 25 ounces B) 23 ounces C) 74 ounces D) 69 ounces

Answer: B

Explanation: A)
B)
C)
D)

The sizes of two matrices A and B are given. Find the sizes of the product AB and the product BA, whenever these products exist.

59) A is 3 × 2, and B is 2 × 3. 59) _____

A) 2 × 2; 3 × 3
B) 3 × 3; BA does not exist.
C) AB does not exist; 2 × 2
D) 3 × 3; 2 × 2

Answer: D

Explanation: A)
B)
C)
D)

Find the matrix product, if possible.

60) $\begin{bmatrix} 3 & -2 & 1 \\ 0 & 4 & -3 \end{bmatrix}\begin{bmatrix} 3 & 0 \\ -2 & 1 \end{bmatrix}$ 60) _____

A) $\begin{bmatrix} 9 & -6 \\ -6 & 8 \\ 3 & -5 \end{bmatrix}$ B) $\begin{bmatrix} 9 & -6 & 3 \\ -6 & 8 & -5 \end{bmatrix}$ C) $\begin{bmatrix} 9 & 0 \\ 0 & 4 \end{bmatrix}$ D) Does not exist

Answer: D

Explanation: A)
B)
C)
D)

Find the ratios of products A, B, and C using a closed model.

61) $\begin{array}{c} \\ A \\ B \\ C \end{array}\begin{array}{c} \begin{array}{ccc} A & B & C \end{array} \\ \begin{bmatrix} 0.1 & 0.5 & 0.5 \\ 0.8 & 0.3 & 0.4 \\ 0.1 & 0.2 & 0.1 \end{bmatrix} \end{array}$ 61) _____

A) 33: 24: 10 B) 55: 76: 23 C) 2: 3: 3 D) 8: 11: 10

Answer: B

Explanation: A)
B)
C)
D)

Use a graphing calculator to find the matrix product and/or sum.

62) Find AB. 62) _____

$A = \begin{bmatrix} 18 & 14 & 18 & 18 \\ 30 & 5 & 7 & 2 \\ 11 & 3 & 2 & 1 \\ 5 & 32 & 5 & 7 \end{bmatrix}$ $B = \begin{bmatrix} 18 & 5 & 3 \\ 18 & 8 & 12 \\ 7 & 4 & 2 \\ 21 & 15 & 13 \end{bmatrix}$

A) $\begin{bmatrix} 468 & 364 & 468 & 468 \\ 1140 & 190 & 266 & 76 \\ 143 & 39 & 26 & 13 \\ 245 & 1568 & 245 & 343 \end{bmatrix}$ B) $\begin{bmatrix} 1224 & 340 & 134 \\ 792 & 352 & 528 \\ 119 & 68 & 34 \\ 1029 & 735 & 637 \end{bmatrix}$

C) $\begin{bmatrix} 1080 & 544 & 492 \\ 721 & 248 & 190 \\ 287 & 102 & 86 \\ 848 & 406 & 500 \end{bmatrix}$ D) Does not exist

Answer: C

Explanation: A)
B)
C)
D)

Use the indicated row operation to change the matrix.

63) Replace R_2 by $R_1 + R_2$. 63) _____

$$\left[\begin{array}{cc|c} 1 & 0 & 2 \\ -1 & 1 & 3 \end{array}\right]$$

A) $\left[\begin{array}{cc|c} 1 & 0 & 2 \\ 0 & 0 & 5 \end{array}\right]$ B) $\left[\begin{array}{cc|c} 1 & 0 & 2 \\ -1 & 1 & 3 \end{array}\right]$ C) $\left[\begin{array}{cc|c} 0 & 1 & 5 \\ -1 & 1 & 3 \end{array}\right]$ D) $\left[\begin{array}{cc|c} 1 & 0 & 2 \\ 0 & 1 & 5 \end{array}\right]$

Answer: D

Explanation: A)
B)
C)
D)

Solve the problem.

64) Suppose the following matrix represents the input-output matrix, T, of a simplified economy. 64) _____

	Manufacturing	Agriculture	Transportation
Manufacturing	0	1/4	1/3
Agriculture	1/2	0	1/4
Transportation	1/4	1/4	0

The demand matrix is

$$D = \begin{bmatrix} 1200 \\ 1200 \\ 1200 \end{bmatrix}$$

Find the amount of each commodity that should be produced.

A) 3360 units of manufacturing, 2796 units of agriculture, and 3012 units of transportation.
B) 2976 units of manufacturing, 3386.4 units of agriculture, and 2791.2 units of transportation.
C) 3012 units of manufacturing, 3360 units of agriculture, and 2791.2 units of transportation.
D) 3012 units of manufacturing, 2796 units of agriculture, and 2976 units of transportation.

Answer: B

Explanation: A)
B)
C)
D)

Solve the system of equations by using the inverse of the coefficient matrix if it exists and by the echelon method if the inverse doesn't exist.

65) $3x + y = 15$ 65) _____
$2x + 4y = 0$

A) $(-3, -6)$ B) $(6, -3)$
C) $(-3, 6)$ D) No inverse, no solution for system

Answer: B

Explanation: A)
B)
C)
D)

Solve the system of equations by using the inverse of the coefficient matrix.

66) $9x - 2y + 5z = 78$
$2x + 3y - 9z = -50$
$3x - 8y + 6z = 49$ 66) _____

A) (6, -1, 7) B) (1, 7, 1) C) (5, -1, -7) D) (5, 1, 7)

Answer: D

Explanation: A)
B)
C)
D)

For the following systems of equations in echelon form, tell how many solutions there are in nonnegative integers.

67) $x + 3y + 4z = 80$
$4y + 5z = 40$ 67) _____

A) 2 B) 4 C) 3 D) 5

Answer: C

Explanation: A)
B)
C)
D)

Use the Gauss-Jordan method to solve the system of equations.

68) $5x - 3y = 6$
$25x - 15y = 9$ 68) _____

A) (6, 9) B) $\left(\frac{6}{5} + \frac{3}{5}y, y\right)$ C) (5, 5) D) No solution

Answer: D

Explanation: A)
B)
C)
D)

Use a graphing calculator to solve the system of equations. Round your solution to one decimal place.

69) $2.6x - 0.7y + 5.3z - 3.4w = 12.9$
$6.5y + 0.7w = -1.8$
$4.0z - 2.2w = 1.5$
$4.9x + 0.6w = 3.2$ 69) _____

A) (2.2, 1.1, 7.2, 12.4) B) (-2.2, 1.1, -6.4, 23.3)
C) (2.2, 1.1, -6.4, -12.4) D) (2.2, -1.1, -6.4, 7.6)

Answer: C

Explanation: A)
B)
C)
D)

Find the ratios of products A, B, and C using a closed model.

70) $\begin{array}{c} \\ A \\ B \\ C \end{array}\begin{array}{c} \begin{array}{ccc} A & B & C \end{array} \\ \begin{bmatrix} 0.4 & 0.3 & 0.4 \\ 0.2 & 0.1 & 0.4 \\ 0.4 & 0.6 & 0.2 \end{bmatrix} \end{array}$ 70) _____

A) 4: 8: 3 B) 3: 2: 3 C) 8: 16: 3 D) 3: 3: 2

Answer: B

Explanation: A)
B)
C)
D)

Use the Gauss-Jordan method to solve the system of equations.

71) $x - y + z = 4$
$x + y + z = -2$
$x + y - z = -12$ 71) _____

A) $(-4, 5, -3)$ B) $(-4, -3, 5)$ C) $(5, -4, -3)$ D) No solution

Answer: B

Explanation: A)
B)
C)
D)

Given matrices $A = \begin{bmatrix} 2 & 3 \\ -1 & 6 \end{bmatrix}$, $B = \begin{bmatrix} 4 & -2 \\ -2 & -1 \end{bmatrix}$, and $C = \begin{bmatrix} -5 & 2 \\ 0 & 1 \end{bmatrix}$, decide if the statement is true or false.

72) AB is a 2×2 matrix. 72) _____

A) True B) False

Answer: A

Explanation: A)
B)

73) $(A + B)^2 = A^2 + 2AB + B^2$, where $A^2 = AA$ and $B^2 = BB$. 73) _____

A) True B) False

Answer: B

Explanation: A)
B)

Find the ratios of products A, B, and C using a closed model.

74) $\begin{array}{c} \\ A \\ B \\ C \end{array}\begin{array}{c} \begin{array}{ccc} A & B & C \end{array} \\ \begin{bmatrix} 0.2 & 0.3 & 0.1 \\ 0.3 & 0.1 & 0.8 \\ 0.5 & 0.6 & 0.1 \end{bmatrix} \end{array}$ 74) _____

A) 13: 25: 100 B) 33: 67: 63 C) 1: 149: 100 D) 1: 25: 25

Answer: B

Explanation: A)
B)
C)
D)

75) $\begin{array}{c} \\ A \\ B \\ C \end{array}\begin{array}{c} \begin{array}{ccc} A & B & C \end{array} \\ \begin{bmatrix} 0.4 & 0 & 0.4 \\ 0 & 0.8 & 0.2 \\ 0.6 & 0.2 & 0.4 \end{bmatrix} \end{array}$ 75) _____

A) 6: 3: 3 B) 1: 3: 3 C) 2: 3: 3 D) 3: 2: 3

Answer: C

Explanation: A)
B)
C)
D)

Find the production matrix for the input-output and demand matrices using the open model.

76) $A = \begin{bmatrix} 0.2 & 0.1 \\ 0.5 & 0.4 \end{bmatrix}$, $D = \begin{bmatrix} 3 \\ 6 \end{bmatrix}$ 76) _____

A) $\begin{bmatrix} 5.13 \\ 14.65 \end{bmatrix}$ B) $\begin{bmatrix} 5.58 \\ 14.65 \end{bmatrix}$ C) $\begin{bmatrix} 5.55 \\ 7.88 \end{bmatrix}$ D) $\begin{bmatrix} 6.98 \\ 18.31 \end{bmatrix}$

Answer: B

Explanation: A)
B)
C)
D)

Find the inverse, if it exists, for the matrix.

77) $\begin{bmatrix} -6 & 5 \\ -4 & 5 \end{bmatrix}$ 77) _____

A) $\begin{bmatrix} -\frac{2}{5} & \frac{3}{5} \\ -\frac{1}{2} & \frac{1}{2} \end{bmatrix}$ B) $\begin{bmatrix} \frac{3}{5} & \frac{1}{2} \\ -\frac{2}{5} & -\frac{1}{2} \end{bmatrix}$ C) $\begin{bmatrix} -\frac{1}{2} & \frac{1}{2} \\ -\frac{2}{5} & \frac{3}{5} \end{bmatrix}$ D) $\begin{bmatrix} -\frac{1}{2} & -\frac{1}{2} \\ \frac{2}{5} & \frac{3}{5} \end{bmatrix}$

Answer: C

Explanation: A)
B)
C)
D)

Provide an appropriate response.

78) True or False? 78) _____

$\begin{bmatrix} 2 & 9 \\ -3 & 4 \end{bmatrix} = \begin{bmatrix} 2 & -3 \\ 9 & 4 \end{bmatrix}$

A) True B) False

Answer: B

Explanation: A)
B)

Use a graphing calculator to find the matrix product and/or sum.

79) Find BA. 79) _____

$$A = \begin{bmatrix} 11 & 14 & 18 & 18 \\ 30 & 5 & 7 & 2 \\ 11 & 3 & 2 & 1 \\ 5 & 32 & 5 & 19 \end{bmatrix} \quad B = \begin{bmatrix} 12 & 5 & 3 \\ 18 & 8 & 12 \\ 7 & 4 & 2 \\ 21 & 15 & 0 \end{bmatrix}$$

A) $\begin{bmatrix} 888 & 509 & 237 \\ 541 & 248 & 164 \\ 221 & 102 & 73 \\ 1070 & 586 & 409 \end{bmatrix}$

B) $\begin{bmatrix} 732 & 305 & 113 \\ 792 & 352 & 528 \\ 119 & 68 & 34 \\ 1281 & 915 & 0 \end{bmatrix}$

C) $\begin{bmatrix} 220 & 280 & 360 & 360 \\ 1140 & 190 & 266 & 76 \\ 143 & 39 & 26 & 13 \\ 180 & 1152 & 180 & 684 \end{bmatrix}$

D) Does not exist

Answer: D

Explanation: A)
B)
C)
D)

Solve the problem.

80) A company makes three chocolate candies: cherry, almond, and raisin. Matrix A gives the amount of ingredients in one batch. Matrix B gives the costs of ingredients from suppliers J and K. What is the cost of 100 batches of each candy using ingredients from supplier K? 80) _____

$$A = \begin{bmatrix} \text{sugar} & \text{choc} & \text{milk} \\ 6 & 8 & 1 \\ 6 & 4 & 1 \\ 5 & 7 & 1 \end{bmatrix} \begin{matrix} \\ \text{cherry} \\ \text{almond} \\ \text{raisin} \end{matrix}$$

$$B = \begin{bmatrix} J & K \\ 4 & 3 \\ 4 & 5 \\ 2 & 2 \end{bmatrix} \begin{matrix} \\ \text{sugar} \\ \text{choc} \\ \text{milk} \end{matrix}$$

A) $12,000 B) $15,200 C) $6000 D) $9400

Answer: B

Explanation: A)
B)
C)
D)

Solve the system of equations by using the inverse of the coefficient matrix.

81) $x - y + z = -7$
$x + y + z = 1$
$x + y - z = -1$ 81) _____

A) $(-4, 1, 4)$ B) $(1, -4, 4)$
C) $(-4, 4, 1)$ D) No inverse, no solution for system

Answer: C
Explanation: A)
B)
C)
D)

Decide whether the matrices are inverses of each other. (Check to see if their product is the identity matrix I.)

82) $\begin{bmatrix} 1 & 2 & 0 \\ -2 & 0 & 2 \\ 3 & 2 & -4 \end{bmatrix}$ and $\begin{bmatrix} \frac{1}{2} & -1 & -\frac{1}{2} \\ \frac{1}{4} & \frac{1}{2} & \frac{1}{4} \\ \frac{1}{2} & -\frac{1}{2} & -\frac{1}{2} \end{bmatrix}$ 82) _____

A) Yes B) No

Answer: A
Explanation: A)
B)

Provide an appropriate response.

83) If A is a 5 × 2 matrix and A+ K = A, what can you say about K? 83) _____

A) K is a 2 × 5 matrix and each of its entries is the negative of the corresponding entry of A.
B) K is a 2 × 5 matrix and all entries of K are equal to 0.
C) K is a 5 × 2 matrix and all entries of K are equal to 0.
D) K is a 5 × 2 matrix and each of its entries is the negative of the corresponding entry of A.

Answer: C
Explanation: A)
B)
C)
D)

Find the value.

84) Let $A = \begin{bmatrix} -5 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \end{bmatrix}$; $2A + 3B$ 84) _____

A) $\begin{bmatrix} -2 & 2 \end{bmatrix}$ B) $\begin{bmatrix} -9 & 4 \end{bmatrix}$ C) $\begin{bmatrix} -7 & 4 \end{bmatrix}$ D) $\begin{bmatrix} -10 & 4 \end{bmatrix}$

Answer: C
Explanation: A)
B)
C)
D)

Use graphing calculator to find the inverse of the matrix. Give 5 decimal places.

85) $A = \begin{bmatrix} 1.52 & 5.55 & 4 \\ -0.63 & 7.33 & 3.21 \\ 8.2 & 0.003 & -2.8 \end{bmatrix}$ 85) _____

A) $\begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$

B) $\begin{bmatrix} 0.65789 & 0.18018 & 0.25 \\ -1.58730 & 0.13643 & 0.31153 \\ 0.12195 & 333.33333 & -0.35714 \end{bmatrix}$

C) $\begin{bmatrix} 0.02137 & -0.01623 & 0.01192 \\ -0.27464 & 0.34436 & 0.00245 \\ 0.62294 & -0.47163 & -0.00792 \end{bmatrix}$

D) $\begin{bmatrix} 0.15171 & -0.11491 & 0.08500 \\ -0.18145 & 0.27379 & 0.05467 \\ 0.44411 & -0.33622 & -0.10815 \end{bmatrix}$

Answer: D

Explanation: A)
B)
C)
D)

Find the matrix product, if possible.

86) $\begin{bmatrix} 1 & 3 & -1 \\ 3 & 0 & 5 \end{bmatrix} \begin{bmatrix} 3 & 0 \\ -1 & 1 \\ 0 & 5 \end{bmatrix}$ 86) _____

A) $\begin{bmatrix} -2 & 0 \\ 25 & 9 \end{bmatrix}$ B) $\begin{bmatrix} 3 & -3 & 0 \\ 0 & 0 & 25 \end{bmatrix}$ C) $\begin{bmatrix} 0 & -2 \\ 9 & 25 \end{bmatrix}$ D) Does not exist

Answer: C

Explanation: A)
B)
C)
D)

Solve the problem.

87) A simplified economy has only two industries, the electric company and the gas company. Each dollar's worth of the electric company's output requires 0.20 of its own output and 0.4 of the gas company's output. Each dollar's worth of the gas company's output requires 0.50 of its own output and 0.7 of the electric company's output. Construct the input-output matrix. 87) _____

A) $\begin{matrix} \text{Electric} \\ \text{Gas} \end{matrix} \begin{bmatrix} 0.70 \\ 1.10 \end{bmatrix}$

B) $\begin{matrix} & \text{Electric} & \text{Gas} \\ \text{Electric} & 0.20 & 0.40 \\ \text{Gas} & 0.70 & 0.50 \end{matrix}$

C) $\begin{matrix} & \text{Electric} & \text{Gas} \\ \text{Electric} & 0.20 & 0.50 \\ \text{Gas} & 0.40 & 0.70 \end{matrix}$

D) $\begin{matrix} & \text{Electric} & \text{Gas} \\ \text{Electric} & 0.20 & 0.70 \\ \text{Gas} & 0.40 & 0.50 \end{matrix}$

Answer: D

Explanation: A)
B)
C)
D)

Solve the system of equations by using the inverse of the coefficient matrix.

88) $\begin{aligned} x - 2y + 3z &= 3 \\ y - z + w &= -6 \\ -2x + 2y - 2z + 4w &= -18 \\ 2y - 3z + w &= -10 \end{aligned}$ 88) _____

A) $(-2, 3, 3, -6)$ B) $(-2, 2, 3, -5)$ C) $(-3, 2, 4, -5)$ D) $(-1, 1, 2, -4)$

Answer: B

Explanation: A)
B)
C)
D)

Solve the problem.

89) An appliance dealer has two stores in the town of Washingwell. 89) _____
During a given week, they have a beginning inventory of

	Washing Machines	Dish Washers	
B =	44	25	Store 1
	51	38	Store 2

a purchase matrix of

	Washing Machines	Dish Washers	
P =	5	3	Store 1
	7	0	Store 2

and an ending inventory of

	Washing Machines	Dish Washers	
E =	8	1	Store 1
	3	2	Store 2

Find the sales matrix.

A)

	Washing Machines	Dish Washers	
S =	41	27	Store 1
	55	36	Store 2

B)

	Washing Machines	Dish Washers	
S =	47	23	Store 1
	47	40	Store 2

C)

	Washing Machines	Dish Washers	
S =	57	29	Store 1
	61	40	Store 2

D)

	Washing Machines	Dish Washers	
S =	31	21	Store 1
	41	36	Store 2

Answer: A
Explanation: A)
B)
C)
D)

Perform the indicated operation, where possible.

90) $\begin{bmatrix} -1 & 5 \\ 0 & 4 \\ 8 & -4 \end{bmatrix} - \begin{bmatrix} 2 & 1 \\ 7 & 4 \\ 2 & 2 \end{bmatrix}$ 90) _____

A) $\begin{bmatrix} 3 & -4 \\ 7 & 0 \\ -6 & 6 \end{bmatrix}$ B) $\begin{bmatrix} -3 & 4 \\ -7 & 0 \\ 6 & -6 \end{bmatrix}$ C) $\begin{bmatrix} 1 & 6 \\ 7 & 8 \\ 10 & -2 \end{bmatrix}$ D) Not possible

Answer: B
Explanation: A)
B)
C)
D)

Solve the problem.

91) Mike, Joe, and Bill are painting a fence. The painting can be finished if Mike and Joe work together for 4 hours and Bill works alone for 2 hours; or if Mike and Joe work together for 2 hours and Bill works alone for 5 hours; or if Mike works alone for 6 hours, Joe works alone for 2 hours, and Bill works alone for 1 hour. How much time does it take for each man working alone to complete the painting? 91) _____

A) Mike: 12 hr; Joe: 10 hr; Bill: 10 hr
B) Mike: 8 hr; Joe: 8 hr; Bill: 16 hr
C) Mike: 16 hr; Joe: 8 hr; Bill: 8 hr
D) Mike: 8 hr; Joe: 16 hr; Bill: 8 hr

Answer: D
Explanation: A)
B)
C)
D)

Solve the system of equations by using the inverse of the coefficient matrix if it exists and by the echelon method if the inverse doesn't exist.

92) $3x - 6y = -3$
$6x - 12y = -9$ 92) _____

A) No inverse, no solution for system
B) $(2, 2)$
C) $(-3, -9)$
D) No inverse, $\left(-1 - \frac{1}{2}y, y\right)$

Answer: A
Explanation: A)
B)
C)
D)

Solve the problem.

93) Carole's car averages 15.3 miles per gallon in city driving and 24.5 miles per gallon in highway driving. If she drove a total of 382.7 miles on 19 gallons of gas, then how many of the gallons were used for city driving? 93) _____

A) 10 gallons B) 11 gallons C) 15 gallons D) 9 gallons

Answer: D

Explanation: A)
B)
C)
D)

94) A company makes three chocolate candies: cherry, almond, and raisin. Matrix A gives the amount of ingredients in one batch. Matrix B gives the costs of ingredients from suppliers R and S. What is the cost of 100 batches of each candy using ingredients from supplier S? 94) _____

$$A = \begin{array}{c} \begin{matrix} \text{sugar} & \text{choc} & \text{milk} \end{matrix} \\ \begin{bmatrix} 4 & 6 & 1 \\ 7 & 3 & 1 \\ 4 & 3 & 1 \end{bmatrix} \end{array} \begin{matrix} \\ \text{cherry} \\ \text{almond} \\ \text{raisin} \end{matrix}$$

$$B = \begin{array}{c} \begin{matrix} R & S \end{matrix} \\ \begin{bmatrix} 6 & 5 \\ 6 & 7 \\ 2 & 2 \end{bmatrix} \end{array} \begin{matrix} \text{sugar} \\ \text{choc} \\ \text{milk} \end{matrix}$$

A) $16,500 B) $6600 C) $13,200 D) $12,000

Answer: A

Explanation: A)
B)
C)
D)

Use the Gauss-Jordan method to solve the system of equations.

95) $8x + 9y - z = 48$
$x - 4y + 7z = 65$
$2x + y + z = 22$ 95) _____

A) (6, 1, 9) B) (6, 9, 1) C) (-6, 1, 12) D) No solution

Answer: A

Explanation: A)
B)
C)
D)

Use graphing calculator to find the inverse of the matrix. Give 5 decimal places.

96) $A = \begin{bmatrix} 1/3 & 2/7 & 4/5 \\ 17/11 & 5 & 0 \\ 18/13 & -5/6 & 8/7 \end{bmatrix}$ 96) _____

A) $\begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$

B) $\begin{bmatrix} 2.65952 & 0.15830 & -1.86167 \\ -9.04238 & -0.33824 & 6.32966 \\ 3.37129 & 0.05484 & -1.48490 \end{bmatrix}$

C) $\begin{bmatrix} -1.10557 & 0.19216 & 0.77390 \\ 0.34172 & 0.14061 & -0.23920 \\ 1.58861 & -0.13028 & -0.23703 \end{bmatrix}$

D) $\begin{bmatrix} 3 & 3.5 & 1.25 \\ 0.64706 & 5 & 0 \\ 0.72222 & -1.2 & 1.14286 \end{bmatrix}$

Answer: C

Explanation: A)
B)
C)
D)

Solve the problem.

97) A company makes three chocolate candies: cherry, almond, and raisin. Matrix A gives the amount of ingredients in one batch. Matrix B gives the costs of ingredients from suppliers X and Y. What is the cost of 100 batches of each candy using ingredients from supplier Y? 97) _____

$A = \begin{bmatrix} \text{sugar} & \text{choc} & \text{milk} \\ 4 & 6 & 1 \\ 5 & 3 & 1 \\ 3 & 3 & 1 \end{bmatrix} \begin{matrix} \\ \text{cherry} \\ \text{almond} \\ \text{raisin} \end{matrix}$

$B = \begin{bmatrix} X & Y \\ 3 & 2 \\ 3 & 4 \\ 2 & 2 \end{bmatrix} \begin{matrix} \text{sugar} \\ \text{choc} \\ \text{milk} \end{matrix}$

A) $6600 B) $7800 C) $3300 D) $4800

Answer: B

Explanation: A)
B)
C)
D)

Given matrices $A = \begin{bmatrix} 2 & 3 \\ -1 & 6 \end{bmatrix}$, $B = \begin{bmatrix} 4 & -2 \\ -2 & -1 \end{bmatrix}$, and $C = \begin{bmatrix} -5 & 2 \\ 0 & 1 \end{bmatrix}$, decide if the statement is true or false.

98) ABC is a 2 × 4 matrix. 98) _____

A) True B) False

Answer: B

Explanation: A)
B)

Perform the indicated operation, where possible.

99) $\begin{bmatrix} 2 & 4 \end{bmatrix} + \begin{bmatrix} -4 \\ 9 \end{bmatrix}$ 99) _____

A) $\begin{bmatrix} -2 & 13 \end{bmatrix}$ B) $\begin{bmatrix} -2 \\ 13 \end{bmatrix}$ C) $\begin{bmatrix} 2 & -4 \\ 4 & 9 \end{bmatrix}$ D) Not possible

Answer: D

Explanation: A)
B)
C)
D)

Solve the problem.

100) A recording company is to release 60 new CDs in the categories of rock, country, jazz, and classical. If twice the number of rock CDs is to equal three times the number of country CDs and if the number of jazz CDs is to equal the number of classical CDs, how can the CDs be distributed among the four types? (Let x be the number of rock CDs, y the number of country CDs, z the number of jazz CDs, and w the number of classical CDs. Let w be the parameter.) 100) _____

A) $x = 36 - w, y = 16 - w, z = w, 0 \le w \le 20$

B) $x = 30 - 3w/5, y = 20 - 2w/5, z = w, 0 \le w \le 26$

C) $x = 36 - 6w/5, y = 24 - 4w/5, z = w, 0 \le w \le 30$

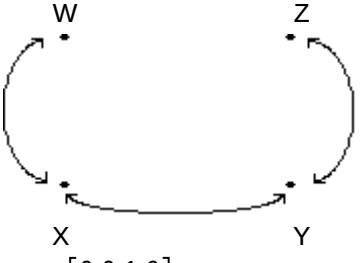
D) $x = 30 - 2w, y = 30 - 2w/5, z = w, 0 \le w \le 30$

Answer: C

Explanation: A)
B)
C)
D)

Write a matrix to display the information.

101) Four fire towers are linked by communication devices as shown in the diagram. Assume that each tower cannot communicate with itself and that communication with the other stations takes place only in the direction of the arrows. Write a 4 × 4 matrix in which rows (and columns) 1, 2, 3, and 4 refer to W, X, Y, and Z, respectively. Make an element a 1 if the tower for that row communicates with the tower for that column, and otherwise make the element a 0. 101) _____



A) $\begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}$ B) $\begin{bmatrix} 0 & 1 & 1 & 0 \\ 1 & 0 & 1 & 0 \\ 1 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{bmatrix}$ C) $\begin{bmatrix} 1 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 1 & 1 & 0 & 1 \end{bmatrix}$ D) $\begin{bmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{bmatrix}$

Answer: D

Explanation: A)
B)
C)
D)

Use the indicated row operation to change the matrix.

102) Replace R_2 by $R_1 + (-1)R_2$. 102) _____

$$\left[\begin{array}{cc|c} 1 & -3 & 4 \\ 2 & 3 & 1 \end{array}\right]$$

A) $\left[\begin{array}{cc|c} 1 & -3 & 2 \\ 2 & 3 & 1 \end{array}\right]$ B) $\left[\begin{array}{cc|c} 1 & -3 & 2 \\ 3 & 0 & 3 \end{array}\right]$ C) $\left[\begin{array}{cc|c} 1 & -3 & 2 \\ 1 & 6 & -1 \end{array}\right]$ D) $\left[\begin{array}{cc|c} 1 & -3 & 4 \\ -1 & -6 & 3 \end{array}\right]$

Answer: D

Explanation: A)
B)
C)
D)

Solve the system of equations. Let z be the parameter.

103) $7x + 3y + 5z = -20$
$3x + y + 2z = 2$ 103) _____

A) $\left(13 - \frac{1}{2}z, 2 + 2z, z\right)$ B) $(-26 + z, 74 + z, z)$

C) $\left(13 - \frac{1}{2}z, -37 - \frac{1}{2}z, z\right)$ D) $\left(13 - \frac{1}{2}z, 2 - 2z, z\right)$

Answer: C

Explanation: A)
B)
C)
D)

Solve the problem.

104) For their class play, Ron sold student tickets for $4.00 each and Kathy sold adult tickets for $6.50 each. If their total revenue for 29 tickets was $141.00, then how many tickets did Ron sell? 104) _____

A) 10 tickets B) 21 tickets C) 19 tickets D) 15 tickets

Answer: C

Explanation: A)
B)
C)
D)

105) A simplified economy has only two industries, the electric company and the gas company. Each dollar's worth of the electric company's output requires 0.20 of its own output and 0.4 of the gas company's output. Each dollar's worth of the gas company's output requires 0.50 of its own output and 0.7 of the electric company's output. What should the production of electricity and gas be (in dollars) if there is a $16 million demand for electricity and a $7 million demand for gas? 105) _____

A) Electricity: $107.5 million; gas: $100 million
B) Electricity: $115 million; gas: $103.5 million
C) Electricity: $125 million; gas: $92.5 million
D) Electricity: $97.5 million; gas: $103 million

Answer: A

Explanation: A)
B)
C)
D)

Solve the matrix equation $AX = B$ for X by finding A^{-1}, given A and B as follows. Use a graphing calculator to obtain your answer, rounding all numbers to four decimal places.

106) $A = \begin{bmatrix} 2 & -1 & 3 \\ -3 & 4 & -5 \\ -4 & 0 & 6 \end{bmatrix}$, $B = \begin{bmatrix} -8 \\ -3 \\ -6 \end{bmatrix}$ 106) _____

A) $\begin{bmatrix} -4.3448 \\ -3.8966 \\ -2.9310 \end{bmatrix}$ B) $\begin{bmatrix} -2.8966 \\ -6.5862 \\ -2.9310 \end{bmatrix}$ C) $\begin{bmatrix} -2.8966 \\ -6.5862 \\ 2.5172 \end{bmatrix}$ D) $\begin{bmatrix} -2.2759 \\ -6.5862 \\ 1.4828 \end{bmatrix}$

Answer: B

Explanation: A)
B)
C)
D)

The sizes of two matrices A and B are given. Find the sizes of the product AB and the product BA, whenever these products exist.

107) A is 2 × 2, and B is 2 × 2. 107) _____

A) 4 × 2; 4 × 2 B) 2 × 2; 2 × 2 C) 2 × 4; 2 × 4 D) 1 × 1; 1 × 1

Answer: B

Explanation: A)
B)
C)
D)

Use a graphing calculator to find the matrix product and/or sum.

108) Find A(B + C). 108) _____

$A = \begin{bmatrix} 19 & -14 & 18 & 18 \\ 30 & 5 & -7 & 2 \\ 11 & 3 & -2 & 1 \\ -5 & 32 & 5 & 10 \end{bmatrix}$ $B = \begin{bmatrix} 5 & 17 & 12 \\ 7 & 6 & -4 \\ -12 & -9 & 15 \\ 3 & -2 & -14 \end{bmatrix}$ $C = \begin{bmatrix} 7 & -4 & 3 \\ -16 & -19 & 20 \\ -6 & -15 & -8 \\ 5 & 16 & 17 \end{bmatrix}$

A) $\begin{bmatrix} 174 & 249 & 241 \\ 457 & 521 & 487 \\ 149 & 166 & 202 \\ -358 & -461 & 502 \end{bmatrix}$ B) $\begin{bmatrix} -158 & 37 & 305 \\ 259 & 580 & 297 \\ 97 & 206 & 88 \\ 174 & 58 & -28 \end{bmatrix}$

C) $\begin{bmatrix} 174 & 37 & 305 \\ 457 & 521 & 487 \\ 97 & 206 & 88 \\ 174 & -461 & 502 \end{bmatrix}$ D) Does not exist

Answer: A

Explanation: A)
B)
C)
D)

Solve the system of equations by using the inverse of the coefficient matrix.

109) $2x + 4y + z = -10$
$4x - 4y - z = -8$
$5x + y + 4z = -1$ 109) _____

A) $(-3, 4, -2)$ B) $(-3, -2, 4)$
C) $(4, -2, -3)$ D) No inverse, no solution for system

Answer: B
Explanation: A)
B)
C)
D)

110) $-4x + 8y - z = 45$
$x + 5y + 7z = 99$
$-7x + y + z = -19$ 110) _____

A) $(5, 9, 7)$ B) $(6, 7, 7)$ C) $(5, -9, -7)$ D) $(9, 7, 9)$

Answer: A
Explanation: A)
B)
C)
D)

Use the Gauss-Jordan method to solve the system of equations.

111) $6x + 5y = 0$
$3x + 9y = 39$ 111) _____

A) $(-5, -6)$ B) $(6, -5)$ C) $(-5, 6)$ D) No solution

Answer: C
Explanation: A)
B)
C)
D)

Solve the problem.

112) A chemistry department wants to make 3 L of a 17.5% basic solution by mixing a 20% solution with a 15% solution. How many liters of each type of basic solution should be used to produce the 17.5% solution? 112) _____

A) 1.5 L of 15% solution and 1.5 L of 20% solution
B) 1 L of 15% solution and 2 L of 20% solution
C) 0.5 L of 15% solution and 2.5 L of 20% solution
D) 2 L of 15% solution and 1 L of 20% solution

Answer: A
Explanation: A)
B)
C)
D)

1) A

2) $A^{-1} = \begin{bmatrix} \frac{-b}{ad - bc} & \frac{d}{ad - bc} \\ \frac{a}{ad - bc} & \frac{-c}{ad - bc} \end{bmatrix}$

3) No. Only square matrices can have inverses, because both $A^{-1}A$ and AA^{-1} must exist and be equal to I. (Explanations may vary.)

4) The terms with variables should be on the left and the constants on the right in each equation, with the variables in the same order in each equation.

5) No. Assume that the matrix had an inverse. In multiplying the row of zeros by the corresponding elements in the columns of the "inverse," you would get all 0's. It would be impossible to multiply the two matrices and get the identity matrix, which has all 1's on the diagonal. (Explanations may vary.)

6) A parameter

7) No. The number of rows (3) is not the same as the number of columns (4).

8) commutative

9) additive identity

10) $AI = \begin{bmatrix} c & d \\ a & b \end{bmatrix} \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

$= \begin{bmatrix} c(1) + d(0) & c(0) + d(1) \\ a(1) + b(0) & a(0) + b(1) \end{bmatrix}$

$= \begin{bmatrix} c & d \\ a & b \end{bmatrix} = A$

11) Each element in row 1 is multiplied by -1 and added to the corresponding element in row 3. The result is the new row 3. All other rows (including row 1) are left unchanged. (Explanations may vary.)

12) Infinitely many solutions

13) A

14) C

15) C

16) D

17) B

18) D

19) C

20) C

21) A

22) B

23) B

24) A

25) C

26) B

27) A

28) B

29) C

30) A

31) B

32) C

33) C

34) B

35) B
36) D
37) C
38) D
39) A
40) A
41) B
42) A
43) C
44) B
45) C
46) D
47) C
48) A
49) D
50) C
51) A
52) D
53) B
54) A
55) C
56) C
57) C
58) B
59) D
60) D
61) B
62) C
63) D
64) B
65) B
66) D
67) C
68) D
69) C
70) B
71) B
72) A
73) B
74) B
75) C
76) B
77) C
78) B
79) D
80) B
81) C
82) A
83) C
84) C

85) D
86) C
87) D
88) B
89) A
90) B
91) D
92) A
93) D
94) A
95) A
96) C
97) B
98) B
99) D
100) C
101) D
102) D
103) C
104) C
105) A
106) B
107) B
108) A
109) B
110) A
111) C
112) A