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

Perform the matrix operation.

1) Let $A = \begin{bmatrix} -3 & 1 \\ 0 & 2 \end{bmatrix}$. Find 5A.

A) $\begin{bmatrix} -15 & 5 \\ 0 & 10 \end{bmatrix}$ B) $\begin{bmatrix} -15 & 1 \\ 0 & 2 \end{bmatrix}$ C) $\begin{bmatrix} -15 & 5 \\ 0 & 2 \end{bmatrix}$ D) $\begin{bmatrix} 2 & 6 \\ 5 & 7 \end{bmatrix}$

Answer: A

2) Let $B = \begin{bmatrix} -1 & 1 & 7 & -3 \end{bmatrix}$. Find −4B.

A) $\begin{bmatrix} 4 & -4 & -28 & 12 \end{bmatrix}$ B) $\begin{bmatrix} -4 & 4 & 28 & -12 \end{bmatrix}$ C) $\begin{bmatrix} 4 & 1 & 7 & -3 \end{bmatrix}$ D) $\begin{bmatrix} -3 & -1 & 5 & -5 \end{bmatrix}$

Answer: A

3) Let $C = \begin{bmatrix} 6 \\ -2 \\ 10 \end{bmatrix}$. Find (1/2) C.

A) $\begin{bmatrix} 3 \\ -2 \\ 10 \end{bmatrix}$ B) $\begin{bmatrix} 6 \\ -1 \\ 10 \end{bmatrix}$ C) $\begin{bmatrix} 3 \\ -1 \\ 5 \end{bmatrix}$ D) $\begin{bmatrix} 12 \\ -4 \\ 20 \end{bmatrix}$

Answer: C

4) Let $A = \begin{bmatrix} 3 & 3 \\ 2 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 4 \\ -1 & 6 \end{bmatrix}$. Find 4A + B.

A) $\begin{bmatrix} 12 & 7 \\ 7 & 10 \end{bmatrix}$ B) $\begin{bmatrix} 12 & 16 \\ 7 & 22 \end{bmatrix}$ C) $\begin{bmatrix} 12 & 16 \\ 1 & 10 \end{bmatrix}$ D) $\begin{bmatrix} 12 & 28 \\ 4 & 40 \end{bmatrix}$

Answer: B

5) Let $C = \begin{bmatrix} 1 \\ -3 \\ 2 \end{bmatrix}$ and $D = \begin{bmatrix} -1 \\ 3 \\ -2 \end{bmatrix}$. Find C − 2D.

A) $\begin{bmatrix} -3 \\ 9 \\ -6 \end{bmatrix}$ B) $\begin{bmatrix} -1 \\ 3 \\ -2 \end{bmatrix}$ C) $\begin{bmatrix} 3 \\ -9 \\ 6 \end{bmatrix}$ D) $\begin{bmatrix} 3 \\ -6 \\ 4 \end{bmatrix}$

Answer: C

6) Let $A = \begin{bmatrix} -1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \end{bmatrix}$. Find 3A + 4B.

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

Answer: A

7) Let $A = \begin{bmatrix} 2 & -4 \\ -2 & -5 \\ 3 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 9 & -8 \\ -6 & -6 \\ -7 & -4 \end{bmatrix}$. Find A + B.

A) $\begin{bmatrix} -7 & 4 \\ 4 & 4 \\ 10 & -4 \end{bmatrix}$ B) $\begin{bmatrix} 11 & -12 \\ -8 & -11 \\ -4 & 1 \end{bmatrix}$ C) $\begin{bmatrix} 11 & -12 \\ 8 & -5 \\ -4 & -1 \end{bmatrix}$ D) $\begin{bmatrix} 11 & -5 \\ -8 & -11 \\ -4 & 1 \end{bmatrix}$

Answer: B

8) Let $A = \begin{bmatrix} -2 & 3 \\ -7 & -2 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 10 \\ -7 & 6 \end{bmatrix}$. Find A – B.

A) $\begin{bmatrix} -4 & -7 \\ 0 & -8 \end{bmatrix}$

B) $\begin{bmatrix} 0 & 7 \\ -14 & 8 \end{bmatrix}$

C) $\begin{bmatrix} 4 & -7 \\ -14 & 4 \end{bmatrix}$

D) $\begin{bmatrix} 0 & -7 \\ 0 & -8 \end{bmatrix}$

Answer: A

9) Let $A = \begin{bmatrix} -3 & 2 \\ 3 & -5 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$. Find A + B.

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

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

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

D) Undefined

Answer: B

Find the matrix product AB, if it is defined.

10) $A = \begin{bmatrix} -1 & 3 \\ 2 & 2 \end{bmatrix}$, $B = \begin{bmatrix} -2 & 0 \\ -1 & 2 \end{bmatrix}$.

A) $\begin{bmatrix} 6 & -1 \\ 4 & -6 \end{bmatrix}$

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

C) $\begin{bmatrix} -1 & 6 \\ -6 & 4 \end{bmatrix}$

D) $\begin{bmatrix} 2 & -6 \\ -1 & 1 \end{bmatrix}$

Answer: C

11) $A = \begin{bmatrix} 0 & -3 \\ 4 & 3 \end{bmatrix}$, $B = \begin{bmatrix} -2 & 0 \\ -1 & 1 \end{bmatrix}$.

A) $\begin{bmatrix} 0 & 6 \\ -4 & 3 \end{bmatrix}$

B) $\begin{bmatrix} -3 & 3 \\ -5 & -11 \end{bmatrix}$

C) $\begin{bmatrix} 3 & -3 \\ -11 & 3 \end{bmatrix}$

D) $\begin{bmatrix} -8 & -6 \\ 4 & 6 \end{bmatrix}$

Answer: C

12) $A = \begin{bmatrix} 3 & -2 \\ 3 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 0 & -2 \\ 4 & 6 \end{bmatrix}$.

A) $\begin{bmatrix} 0 & 4 \\ 12 & 0 \end{bmatrix}$

B) $\begin{bmatrix} -18 & -8 \\ -6 & 0 \end{bmatrix}$

C) $\begin{bmatrix} -8 & -18 \\ 0 & -6 \end{bmatrix}$

D) $\begin{bmatrix} -6 & 0 \\ 30 & -8 \end{bmatrix}$

Answer: C

13) $A = \begin{bmatrix} -1 & 3 \\ 1 & 6 \end{bmatrix}$, $B = \begin{bmatrix} 0 & -2 & 6 \\ 1 & -3 & 2 \end{bmatrix}$.

A) $\begin{bmatrix} 3 & 6 & -7 \\ -20 & 0 & 18 \end{bmatrix}$

B) $\begin{bmatrix} 3 & -7 & 0 \\ 6 & -20 & 18 \end{bmatrix}$

C) $\begin{bmatrix} 0 & -6 \\ 18 & 1 \\ -18 & 12 \end{bmatrix}$

D) AB is undefined.

Answer: B

14) $A = \begin{bmatrix} 3 & -2 & 1 \\ 0 & 4 & -1 \end{bmatrix}$, $B = \begin{bmatrix} 4 & 0 \\ -2 & 2 \end{bmatrix}$.

A) $\begin{bmatrix} 12 & -8 & 4 \\ -6 & 12 & -4 \end{bmatrix}$ B) $\begin{bmatrix} 12 & 0 \\ 0 & 8 \end{bmatrix}$ C) AB is undefined. D) $\begin{bmatrix} 12 & -6 \\ -8 & 12 \\ 4 & -4 \end{bmatrix}$

Answer: C

15) $A = \begin{bmatrix} 0 & -2 \\ 4 & 3 \end{bmatrix}$, $B = \begin{bmatrix} -1 & 3 & 2 \\ 0 & -3 & 1 \end{bmatrix}$.

A) AB is undefined. B) $\begin{bmatrix} 0 & 6 & -2 \\ -4 & 3 & 11 \end{bmatrix}$ C) $\begin{bmatrix} 0 & -6 & -8 \\ 0 & -9 & 3 \end{bmatrix}$ D) $\begin{bmatrix} 0 & -4 & 6 \\ 3 & -2 & 11 \end{bmatrix}$

Answer: B

16) $A = \begin{bmatrix} 1 & 3 & -1 \\ 3 & 0 & 5 \end{bmatrix}$, $B = \begin{bmatrix} 3 & 0 \\ -1 & 1 \\ 0 & 5 \end{bmatrix}$.

A) AB is undefined. B) $\begin{bmatrix} -2 & 0 \\ 25 & 9 \end{bmatrix}$ C) $\begin{bmatrix} 3 & -3 & 0 \\ 0 & 0 & 25 \end{bmatrix}$ D) $\begin{bmatrix} 0 & -2 \\ 9 & 25 \end{bmatrix}$

Answer: D

17) $A = \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 2 & -2 \\ 2 & -2 & 2 \end{bmatrix}$.

A) $\begin{bmatrix} 1 & 2 & -2 \\ 4 & -4 & 4 \end{bmatrix}$ B) AB is undefined. C) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & -4 & 4 \end{bmatrix}$ D) $\begin{bmatrix} 4 & -4 & 4 \\ 1 & 2 & -2 \end{bmatrix}$

Answer: A

The sizes of two matrices A and B are given. Find the sizes of the product AB and the product BA, if the products are defined.

18) A is 4 × 4, B is 4 × 4.

A) AB is 8 × 4, BA is 8 × 4.
B) AB is 4 × 4, BA is 4 × 4.
C) AB is 4 × 8, BA is 4 × 8.
D) AB is 1 × 1, BA is 1 × 1.

Answer: B

19) A is 2 × 1, B is 1 × 1.

A) AB is 2 × 1, BA is undefined.
B) AB is undefined, BA is 1× 2.
C) AB is 1 × 2, BA is 1 × 1.
D) AB is 2 × 2, BA is 1 × 1.

Answer: A

20) A is 1 × 4, B is 4 × 1.

A) AB is 1 × 1, BA is 4 × 4.
B) AB is 4 × 4, BA is 1 × 1.
C) AB is 1 × 1, BA is undefined.
D) AB is undefined, BA is 4 × 4.

Answer: A

21) A is 2 × 4, B is 2 × 4.

A) AB is undefined, BA is undefined.
B) AB is 2 × 4, BA is 4 × 2.
C) AB is 4 × 2, BA is 2 × 4.
D) AB is 2 × 2, BA is 4 × 4.

Answer: A

Find the transpose of the matrix.

22) $\begin{bmatrix} 8 & 4 \\ -4 & 0 \\ -7 & 7 \end{bmatrix}$

A) $\begin{bmatrix} 8 & -4 & -7 \\ 4 & 0 & 7 \end{bmatrix}$
B) $\begin{bmatrix} 4 & 0 & 7 \\ 8 & -4 & -7 \end{bmatrix}$
C) $\begin{bmatrix} -7 & 7 \\ -4 & 0 \\ 8 & 4 \end{bmatrix}$
D) $\begin{bmatrix} 4 & 8 \\ 0 & -4 \\ 7 & -7 \end{bmatrix}$

Answer: A

23) $\begin{bmatrix} 7 & 4 & 7 & 4 \\ 0 & -7 & 0 & -7 \end{bmatrix}$

A) $\begin{bmatrix} 4 & 7 & 4 & 7 \\ -7 & 0 & -7 & 0 \end{bmatrix}$
B) $\begin{bmatrix} 7 & 0 \\ 4 & -7 \\ 7 & 0 \\ 4 & -7 \end{bmatrix}$
C) $\begin{bmatrix} 0 & 7 \\ -7 & 4 \\ 0 & 7 \\ -7 & 4 \end{bmatrix}$
D) $\begin{bmatrix} 0 & -7 & 0 & -7 \\ 7 & 4 & 7 & 4 \end{bmatrix}$

Answer: B

Decide whether or not the matrices are inverses of each other.

24) $\begin{bmatrix} 5 & 3 \\ 3 & 2 \end{bmatrix}$ and $\begin{bmatrix} 2 & -3 \\ -3 & 5 \end{bmatrix}$

A) No
B) Yes

Answer: B

25) $\begin{bmatrix} 10 & 1 \\ -1 & 0 \end{bmatrix}$ and $\begin{bmatrix} 0 & 1 \\ -1 & 10 \end{bmatrix}$

A) No
B) Yes

Answer: A

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

A) Yes
B) No

Answer: B

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

A) No
B) Yes

Answer: B

28) $\begin{bmatrix} 6 & -5 \\ -3 & 5 \end{bmatrix}$ and $\begin{bmatrix} \frac{1}{3} & \frac{1}{3} \\ \frac{1}{5} & \frac{2}{5} \end{bmatrix}$

A) No B) Yes

Answer: B

29) $\begin{bmatrix} 9 & 4 \\ 4 & 4 \end{bmatrix}$ and $\begin{bmatrix} -0.2 & 0.2 \\ 0.2 & -0.45 \end{bmatrix}$

A) Yes B) No

Answer: B

30) $\begin{bmatrix} 9 & -2 \\ 7 & -2 \end{bmatrix}$ and $\begin{bmatrix} 0.5 & 0.5 \\ -\frac{7}{4} & -\frac{9}{4} \end{bmatrix}$

A) No B) Yes

Answer: A

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

A) Yes B) No

Answer: B

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

A) No B) Yes

Answer: A

Find the inverse of the matrix, if it exists.

33) $A = \begin{bmatrix} -3 & -4 \\ 3 & -4 \end{bmatrix}$

A) $\begin{bmatrix} -\frac{1}{8} & \frac{1}{6} \\ -\frac{1}{8} & -\frac{1}{6} \end{bmatrix}$ B) $\begin{bmatrix} -\frac{1}{6} & -\frac{1}{6} \\ \frac{1}{8} & -\frac{1}{8} \end{bmatrix}$ C) $\begin{bmatrix} -\frac{1}{8} & -\frac{1}{8} \\ -\frac{1}{6} & \frac{1}{6} \end{bmatrix}$ D) $\begin{bmatrix} -\frac{1}{6} & \frac{1}{6} \\ -\frac{1}{8} & -\frac{1}{8} \end{bmatrix}$

Answer: D

34) $A = \begin{bmatrix} 0 & -5 \\ 6 & 3 \end{bmatrix}$

A) $\begin{bmatrix} 0 & \frac{1}{6} \\ -\frac{1}{5} & \frac{1}{10} \end{bmatrix}$ B) $\begin{bmatrix} \frac{1}{10} & -\frac{1}{6} \\ \frac{1}{5} & 0 \end{bmatrix}$ C) $\begin{bmatrix} -\frac{1}{5} & 0 \\ \frac{1}{10} & \frac{1}{6} \end{bmatrix}$ D) $\begin{bmatrix} \frac{1}{10} & \frac{1}{6} \\ -\frac{1}{5} & 0 \end{bmatrix}$

Answer: D

35) $A = \begin{bmatrix} 5 & 0 \\ -4 & -6 \end{bmatrix}$

A) $\begin{bmatrix} \frac{1}{5} & 0 \\ -\frac{2}{15} & -\frac{1}{6} \end{bmatrix}$

B) A is not invertible

C) $\begin{bmatrix} \frac{1}{5} & 0 \\ \frac{2}{15} & -\frac{1}{6} \end{bmatrix}$

D) $\begin{bmatrix} -\frac{1}{6} & 0 \\ -\frac{2}{15} & \frac{1}{5} \end{bmatrix}$

Answer: A

36) $A = \begin{bmatrix} -5 & -5 \\ 2 & 2 \end{bmatrix}$

A) $\begin{bmatrix} \frac{2}{21} & \frac{5}{21} \\ -\frac{2}{21} & -\frac{5}{21} \end{bmatrix}$

B) A is not invertible

C) $\begin{bmatrix} -\frac{2}{21} & -\frac{5}{21} \\ \frac{2}{21} & \frac{5}{21} \end{bmatrix}$

D) $\begin{bmatrix} \frac{2}{21} & -\frac{5}{21} \\ \frac{2}{21} & -\frac{5}{21} \end{bmatrix}$

Answer: B

37) $A = \begin{bmatrix} 1 & 4 \\ 0 & -6 \end{bmatrix}$

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

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

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

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

Answer: C

38) $A = \begin{bmatrix} 6 & 3 \\ 3 & 0 \end{bmatrix}$

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

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

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

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

Answer: A

39) $\begin{bmatrix} 1 & 0 & 0 \\ -1 & 1 & 0 \\ 1 & 1 & 1 \end{bmatrix}$

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

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

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

D) $\begin{bmatrix} -1 & 0 & 0 \\ -1 & -1 & 0 \\ -1 & -1 & -1 \end{bmatrix}$

Answer: C

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

40) $6x_1 + 5x_2 = 13$
$5x_1 + 3x_2 = 5$

A) (–2, 5) B) No solution C) (–2, –5) D) (5, –2)

Answer: A

41) $6x_1 + 3x_2 = 0$
$2x_1 = -6$

A) (6, –3) B) (–3, 6) C) No solution D) (–3, –6)

Answer: B

42) $-3x_1 - 2x_2 = 2$
$6x_1 + 4x_2 = 8$

A) (–2, –2) B) $\left(-\frac{2}{3} + \frac{3}{2}x_2, x_2\right)$ C) No solution D) (2, 8)

Answer: C

43) $2x_1 + 6x_2 = 2$
$2x_1 - x_2 = -5$

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

Answer: C

44) $2x_1 - 6x_2 = -6$
$3x_1 + 2x_2 = 13$

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

Answer: C

45) $10x_1 - 4x_2 = -6$
$6x_1 - x_2 = 2$

A) (–4, –1) B) (1, 4) C) (4, 1) D) (–1, –4)

Answer: B

46) $2x_1 - 4x_2 = -2$
$3x_1 + 4x_2 = -23$

A) (–2, 5) B) (2, 5) C) (–5, –2) D) (5, 2)

Answer: C

47) $-5x_1 + 3x_2 = 8$
$-2x_1 + 4x_2 = 20$

A) (2, 6) B) (–6, –2) C) (–2, –6) D) (6, 2)

Answer: A

Find the inverse of the matrix A, if it exists.

48) $A = \begin{bmatrix} 5 & -1 & 5 \\ 5 & 0 & 3 \\ 10 & -1 & 8 \end{bmatrix}$

A) $A^{-1} = \begin{bmatrix} 5 & 5 & 10 \\ -1 & 0 & -1 \\ 5 & 3 & 8 \end{bmatrix}$

B) A^{-1} does not exist.

C) $A^{-1} = \begin{bmatrix} 1 & 0 & \frac{3}{5} \\ 0 & 1 & -2 \\ 0 & 0 & 0 \end{bmatrix}$

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

Answer: B

49) $A = \begin{bmatrix} 1 & 1 & 1 \\ 2 & 1 & 1 \\ 2 & 2 & 3 \end{bmatrix}$

A) $A^{-1} = \begin{bmatrix} -1 & -1 & -1 \\ -2 & -1 & -1 \\ -2 & -2 & -3 \end{bmatrix}$

B) $A^{-1} = \begin{bmatrix} -1 & 1 & 0 \\ 4 & -1 & -1 \\ -2 & 0 & 1 \end{bmatrix}$

C) A^{-1} does not exist.

D) $A^{-1} = \begin{bmatrix} 1 & 1 & 1 \\ \frac{1}{2} & 1 & 1 \\ \frac{1}{2} & \frac{1}{2} & \frac{1}{3} \end{bmatrix}$

Answer: B

50) $A = \begin{bmatrix} 1 & 3 & 2 \\ 1 & 3 & 3 \\ 2 & 7 & 8 \end{bmatrix}$

A) $A^{-1} = \begin{bmatrix} 1 & \frac{1}{3} & \frac{1}{2} \\ 1 & \frac{1}{3} & \frac{1}{3} \\ \frac{1}{2} & \frac{1}{7} & \frac{1}{8} \end{bmatrix}$

B) $A^{-1} = \begin{bmatrix} -3 & 10 & -3 \\ 2 & -4 & 1 \\ -1 & 1 & 0 \end{bmatrix}$

C) $A^{-1} = \begin{bmatrix} -1 & -3 & -2 \\ -1 & -3 & -3 \\ -2 & -7 & -8 \end{bmatrix}$

D) A^{-1} does not exist.

Answer: B

51) $A = \begin{bmatrix} 1 & 0 & 8 \\ 1 & 2 & 3 \\ 2 & 5 & 3 \end{bmatrix}$

A) $A^{-1} = \begin{bmatrix} -1 & 0 & -8 \\ -1 & -2 & -3 \\ -2 & -5 & -3 \end{bmatrix}$

B) $A^{-1} = \begin{bmatrix} 1 & 1 & 2 \\ 0 & 2 & 5 \\ 8 & 3 & 3 \end{bmatrix}$

C) A^{-1} does not exist.

D) $A^{-1} = \begin{bmatrix} 9 & -40 & 16 \\ -3 & 13 & -5 \\ -1 & 5 & -2 \end{bmatrix}$

Answer: D

52) $A = \begin{bmatrix} 8 & -4 & 2 \\ 11 & -7 & 4 \\ 3 & -3 & 2 \end{bmatrix}$

A) $A^{-1} = \begin{bmatrix} 8 & 11 & 3 \\ -4 & -7 & -3 \\ 2 & 4 & 2 \end{bmatrix}$

B) A^{-1} does not exist.

C) $A^{-1} = \begin{bmatrix} \frac{2}{11} & \frac{2}{11} & -2 \\ \frac{3}{11} & \frac{8}{7} & 2 \\ \frac{8}{3} & -\frac{2}{3} & \frac{1}{2} \end{bmatrix}$

D) $A^{-1} = \begin{bmatrix} \frac{1}{8} & \frac{1}{11} & \frac{1}{2} \\ \frac{1}{11} & -\frac{1}{7} & \frac{1}{4} \\ \frac{1}{3} & -\frac{1}{3} & \frac{1}{2} \end{bmatrix}$

Answer: B

53) $A = \begin{bmatrix} 0 & 3 & 3 \\ -1 & 0 & 4 \\ 0 & 7 & 0 \end{bmatrix}$

A) A^{-1} does not exist.

B) $A^{-1} = \begin{bmatrix} \frac{4}{3} & 0 & \frac{1}{3} \\ -1 & 0 & 0 \\ -\frac{4}{7} & \frac{1}{7} & -\frac{1}{7} \end{bmatrix}$

C) $A^{-1} = \begin{bmatrix} -\frac{4}{3} & -1 & -\frac{4}{7} \\ -\frac{1}{7} & 0 & \frac{1}{7} \\ \frac{1}{3} & 0 & 0 \end{bmatrix}$

D) $A^{-1} = \begin{bmatrix} \frac{4}{3} & -1 & -\frac{4}{7} \\ 0 & 0 & \frac{1}{7} \\ \frac{1}{3} & 0 & -\frac{1}{7} \end{bmatrix}$

Answer: D

Determine whether the matrix is invertible.

54) $\begin{bmatrix} 2 & 9 \\ 1 & 14 \end{bmatrix}$

A) No B) Yes

Answer: B

55) $\begin{bmatrix} 9 & 5 & -9 \\ 4 & 2 & -4 \\ -3 & 0 & 3 \end{bmatrix}$

A) No B) Yes

Answer: A

Identify the indicated submatrix.

56) $A = \left[\begin{array}{ccc|c} 0 & 1 & -4 & -5 \\ 4 & -1 & 0 & 7 \\ \hline 2 & 5 & -7 & 0 \end{array}\right]$. Find A_{12}.

A) $\begin{bmatrix} 4 \end{bmatrix}$ B) $\begin{bmatrix} -5 \\ 7 \end{bmatrix}$ C) 1 D) $\begin{bmatrix} 2 & 5 & -7 \end{bmatrix}$

Answer: B

57) $A = \left[\begin{array}{cc|c} 2 & 6 & 1 \\ -2 & 0 & -1 \\ 0 & 3 & -6 \\ \hline 3 & 6 & 3 \end{array}\right]$. Find A_{21}.

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

Answer: D

Find the matrix product AB for the partitioned matrices.

58) $A = \left[\begin{array}{cc|c} 4 & 0 & 1 \\ 2 & -1 & -3 \\ \hline 5 & 3 & 7 \end{array}\right]$, $B = \left[\begin{array}{ccc|c} -2 & 0 & 8 & 5 \\ 1 & 6 & 2 & 2 \\ \hline 4 & -1 & 0 & 3 \end{array}\right]$

A) $\left[\begin{array}{ccc|c} -4 & -1 & 32 & 23 \\ -17 & -3 & 14 & -1 \\ \hline 21 & 11 & 46 & 52 \end{array}\right]$

B) $\left[\begin{array}{ccc|c} -8 & 0 & 32 & 20 \\ -5 & -6 & 14 & 8 \\ -7 & 18 & 46 & 31 \end{array}\right]$

C) $\left[\begin{array}{ccc|c} -4 & -1 & 0 & 3 \\ -12 & -3 & 0 & -9 \\ \hline 28 & -7 & 0 & 21 \end{array}\right]$

D) $\left[\begin{array}{ccc|c} -4 & -1 & 32 & 23 \\ -17 & -3 & 14 & -1 \\ 21 & 11 & 46 & 52 \end{array}\right]$

Answer: D

59) $A = \begin{bmatrix} 0 & I \\ I & F \end{bmatrix}$, $B = \begin{bmatrix} W & X \\ Y & Z \end{bmatrix}$

A) $\begin{bmatrix} Y & Z \\ W + YF & X + ZF \end{bmatrix}$ B) $\begin{bmatrix} X & W + XF \\ Z & Y + ZF \end{bmatrix}$ C) $\begin{bmatrix} 0 & Z \\ FY & FZ \end{bmatrix}$ D) $\begin{bmatrix} Y & Z \\ W + FY & X + FZ \end{bmatrix}$

Answer: D

Solve the equation Ax = b by using the LU factorization given for A.

60) $A = \begin{bmatrix} 3 & -1 & 2 \\ -6 & 4 & -5 \\ 9 & 5 & 6 \end{bmatrix}$, $\mathbf{b} = \begin{bmatrix} 6 \\ -3 \\ 2 \end{bmatrix}$

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

A) $\mathbf{x} = \begin{bmatrix} 22 \\ -7 \\ 15 \end{bmatrix}$ B) $\mathbf{x} = \begin{bmatrix} 25 \\ -58 \\ 51 \end{bmatrix}$ C) $\mathbf{x} = \begin{bmatrix} 49 \\ -38 \\ 32 \end{bmatrix}$ D) $\mathbf{x} = \begin{bmatrix} 10 \\ -2 \\ -13 \end{bmatrix}$

Answer: D

61) $A = \begin{bmatrix} 1 & 2 & 4 & 3 \\ -1 & -3 & -1 & -4 \\ 2 & 1 & 19 & 3 \\ 1 & 5 & -9 & 7 \end{bmatrix}$, $\mathbf{b} = \begin{bmatrix} 2 \\ 0 \\ 4 \\ 3 \end{bmatrix}$

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

A) $\mathbf{x} = \begin{bmatrix} 27 \\ 9 \\ 8 \\ -3 \end{bmatrix}$ B) $\mathbf{x} = \begin{bmatrix} 27 \\ -18 \\ 89 \\ -13 \end{bmatrix}$ C) $\mathbf{x} = \begin{bmatrix} 2 \\ -2 \\ 8 \\ -3 \end{bmatrix}$ D) $\mathbf{x} = \begin{bmatrix} 41 \\ -6 \\ -3 \\ -5 \end{bmatrix}$

Answer: D

Find an LU factorization of the matrix A.

62) $A = \begin{bmatrix} 4 & -1 \\ -24 & 9 \end{bmatrix}$

A) $A = \begin{bmatrix} 1 & 0 \\ -6 & 1 \end{bmatrix} \begin{bmatrix} 4 & -1 \\ 0 & 3 \end{bmatrix}$ B) $A = \begin{bmatrix} 1 & 0 \\ 4 & 1 \end{bmatrix} \begin{bmatrix} -6 & -1 \\ 0 & 3 \end{bmatrix}$

C) $A = \begin{bmatrix} 1 & 0 \\ -6 & 1 \end{bmatrix} \begin{bmatrix} 4 & 1 \\ 0 & -3 \end{bmatrix}$ D) $A = \begin{bmatrix} 1 & 0 \\ 6 & 1 \end{bmatrix} \begin{bmatrix} -4 & -1 \\ 0 & -3 \end{bmatrix}$

Answer: A

63) $A = \begin{bmatrix} 2 & 3 & 5 \\ 4 & 9 & 5 \\ 4 & -3 & 24 \end{bmatrix}$

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

B) $A = \begin{bmatrix} 1 & 0 & 0 \\ 4 & 1 & 0 \\ 4 & -3 & 1 \end{bmatrix} \begin{bmatrix} 2 & 3 & 5 \\ 0 & 9 & 5 \\ 0 & 0 & 24 \end{bmatrix}$

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

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

Answer: D

Determine the production vector x that will satisfy demand in an economy with the given consumption matrix C and final demand vector d. Round production levels to the nearest whole number.

64) $C = \begin{bmatrix} .4 & .3 \\ .1 & .6 \end{bmatrix}$, $\mathbf{d} = \begin{bmatrix} 52 \\ 74 \end{bmatrix}$

A) $\mathbf{x} = \begin{bmatrix} 205 \\ 236 \end{bmatrix}$ B) $\mathbf{x} = \begin{bmatrix} 4 \\ 24 \end{bmatrix}$ C) $\mathbf{x} = \begin{bmatrix} 43 \\ 4 \end{bmatrix}$ D) $\mathbf{x} = \begin{bmatrix} 43 \\ 50 \end{bmatrix}$

Answer: A

65) $C = \begin{bmatrix} .2 & .1 & .1 \\ .3 & .2 & .3 \\ .4 & .1 & .3 \end{bmatrix}$, $\mathbf{d} = \begin{bmatrix} 213 \\ 323 \\ 298 \end{bmatrix}$

A) $\mathbf{x} = \begin{bmatrix} 108 \\ 105 \\ 91 \end{bmatrix}$ B) $\mathbf{x} = \begin{bmatrix} 482 \\ 895 \\ 829 \end{bmatrix}$ C) $\mathbf{x} = \begin{bmatrix} 105 \\ 218 \\ 207 \end{bmatrix}$ D) $\mathbf{x} = \begin{bmatrix} 728 \\ 978 \\ -302 \end{bmatrix}$

Answer: B

Solve the problem.

66) Compute the matrix of the transformation that performs the shear transformation $\mathbf{x} \to A\mathbf{x}$ for $A = \begin{bmatrix} 1 & 0.20 \\ 0 & 1 \end{bmatrix}$ and then scales all x–coordinates by a factor of 0.61.

A) $\begin{bmatrix} 1.61 & 0.20 \\ 0 & 2 \end{bmatrix}$ B) $\begin{bmatrix} 1 & 0.20 \\ 0 & 0.61 \end{bmatrix}$ C) $\begin{bmatrix} 0.61 & 0.20 \\ 0 & 1 \end{bmatrix}$ D) $\begin{bmatrix} 0.61 & 0.122 \\ 0 & 1 \end{bmatrix}$

Answer: D

67) Compute the matrix of the transformation that performs the shear transformation $\mathbf{x} \to A\mathbf{x}$ for $A = \begin{bmatrix} 1 & 0.25 \\ 0 & 1 \end{bmatrix}$ and then scales all y–coordinates by a factor of 0.68.

A) $\begin{bmatrix} 1 & 0.17 \\ 0 & 0.68 \end{bmatrix}$ B) $\begin{bmatrix} 2 & 0.25 \\ 0 & 1.68 \end{bmatrix}$ C) $\begin{bmatrix} 0.68 & 0.17 \\ 0 & 1 \end{bmatrix}$ D) $\begin{bmatrix} 1 & 0.25 \\ 0 & 0.68 \end{bmatrix}$

Answer: D

Find the 3 × 3 matrix that produces the described transformation, using homogeneous coordinates.

68) $(x, y) \rightarrow (x + 7, y + 4)$

A) $\begin{bmatrix} 1 & 0 & 4 \\ 0 & 1 & 7 \\ 0 & 0 & 1 \end{bmatrix}$ B) $\begin{bmatrix} 1 & 0 & 7 \\ 0 & 1 & 4 \\ 0 & 0 & 0 \end{bmatrix}$ C) $\begin{bmatrix} 1 & 0 & 7 \\ 0 & 1 & 4 \\ 0 & 0 & 1 \end{bmatrix}$ D) $\begin{bmatrix} 7 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

Answer: C

69) Reflect through the x–axis

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

Answer: A

Find the 3 × 3 matrix that produces the described composite 2D transformation, using homogeneous coordinates.

70) Rotate points through 45° and then scale the x–coordinate by 0.6 and the y–coordinate by 0.8.

A) $\begin{bmatrix} 0.3\sqrt{2} & 0.3\sqrt{2} & 0 \\ -0.4\sqrt{2} & 0.4\sqrt{2} & 0 \\ 0 & 0 & 1 \end{bmatrix}$ B) $\begin{bmatrix} 0.3 & -0.4\sqrt{2} & 0 \\ 0.3\sqrt{2} & 0.4 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

C) $\begin{bmatrix} 0 & -0.6 & 0 \\ 0.8 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ D) $\begin{bmatrix} 0.3\sqrt{2} & -0.3\sqrt{2} & 0 \\ 0.4\sqrt{2} & 0.4\sqrt{2} & 0 \\ 0 & 0 & 1 \end{bmatrix}$

Answer: D

71) Translate by (8, 6), and then reflect through the line $y = x$.

A) $\begin{bmatrix} 0 & 1 & 8 \\ 1 & 0 & 6 \\ 0 & 0 & 1 \end{bmatrix}$ B) $\begin{bmatrix} 0 & 1 & 6 \\ 1 & 0 & 8 \\ 0 & 0 & 1 \end{bmatrix}$ C) $\begin{bmatrix} 0 & 6 & 1 \\ 8 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ D) $\begin{bmatrix} -1 & 0 & -8 \\ 0 & -1 & -6 \\ 0 & 0 & 1 \end{bmatrix}$

Answer: B

Find the 4 × 4 matrix that produces the described transformation, using homogeneous coordinates.

72) Translation by the vector (4, –6, –3)

A) $\begin{bmatrix} 4 & 0 & 0 & 0 \\ 0 & -6 & 0 & 0 \\ 0 & 0 & -3 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$ B) $\begin{bmatrix} 1 & 0 & 0 & 4 \\ 0 & 1 & 0 & -6 \\ 0 & 0 & 1 & -3 \\ 0 & 0 & 0 & 1 \end{bmatrix}$ C) $\begin{bmatrix} 0 & 0 & 0 & 4 \\ 0 & 0 & 0 & -6 \\ 0 & 0 & 0 & -3 \\ 0 & 0 & 0 & 1 \end{bmatrix}$ D) $\begin{bmatrix} 1 & 0 & 0 & -4 \\ 0 & 1 & 0 & 6 \\ 0 & 0 & 1 & 3 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

Answer: B

73) Rotation about the y–axis through an angle of 60°

A) $\begin{bmatrix} 0.5 & 0 & \sqrt{3}/2 & 0 \\ 0 & 1 & 0 & 0 \\ -\sqrt{3}/2 & 0 & 0.5 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

B) $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0.5 & \sqrt{3}/2 & 0 \\ 0 & -\sqrt{3}/2 & 0.5 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

C) $\begin{bmatrix} 0.5 & \sqrt{3}/2 & 0 & 0 \\ -\sqrt{3}/2 & 0.5 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

D) $\begin{bmatrix} \sqrt{3}/2 & 0 & 0.5 & 0 \\ 0 & 1 & 0 & 0 \\ -0.5 & 0 & \sqrt{3}/2 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

Answer: A

Determine whether b is in the column space of A.

74) $A = \begin{bmatrix} 1 & 2 & -3 \\ 1 & 4 & -6 \\ -3 & -2 & 5 \end{bmatrix}, \mathbf{b} = \begin{bmatrix} 1 \\ -2 \\ -3 \end{bmatrix}$

A) No

B) Yes

Answer: B

75) $A = \begin{bmatrix} -1 & 0 & 2 \\ 5 & 8 & -10 \\ -3 & -3 & 6 \end{bmatrix}, \mathbf{b} = \begin{bmatrix} -4 \\ 3 \\ 4 \end{bmatrix}$

A) Yes

B) No

Answer: B

Find a basis for the null space of the matrix.

76) $A = \begin{bmatrix} 1 & 0 & -7 & -4 \\ 0 & 1 & 5 & -2 \\ 0 & 0 & 0 & 0 \end{bmatrix}$

A) $\left\{ \begin{bmatrix} 7 \\ -5 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 4 \\ 2 \\ 0 \\ 1 \end{bmatrix} \right\}$

B) $\left\{ \begin{bmatrix} -7 \\ 5 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} -4 \\ -2 \\ 0 \\ 1 \end{bmatrix} \right\}$

C) $\left\{ \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix} \right\}$

D) $\left\{ \begin{bmatrix} 1 \\ 0 \\ -7 \\ -4 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 5 \\ -2 \end{bmatrix} \right\}$

Answer: A

77) $A = \begin{bmatrix} 1 & 0 & -4 & 0 & -4 \\ 0 & 1 & 2 & 0 & 2 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$

A) $\left\{ \begin{bmatrix} 4 \\ -2 \\ 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 4 \\ -2 \\ 0 \\ -1 \\ 1 \end{bmatrix} \right\}$

B) $\left\{ \begin{bmatrix} 1 \\ 0 \\ -4 \\ 0 \\ -4 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 2 \\ 0 \\ 2 \end{bmatrix} \right\}$

C) $\left\{ \begin{bmatrix} 1 \\ 0 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ 1 \\ 0 \end{bmatrix} \right\}$

D) $\left\{ \begin{bmatrix} -4 \\ 2 \\ 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} -4 \\ 2 \\ 0 \\ -1 \\ 1 \end{bmatrix} \right\}$

Answer: A

Find a basis for the column space of the matrix.

78) $B = \begin{bmatrix} 1 & -2 & 5 & -3 \\ 2 & -4 & 13 & -2 \\ -3 & 6 & -15 & 9 \end{bmatrix}$

A) $\left\{ \begin{bmatrix} 1 \\ 2 \\ -3 \end{bmatrix}, \begin{bmatrix} -2 \\ -4 \\ 6 \end{bmatrix} \right\}$

B) $\left\{ \begin{bmatrix} 1 \\ 2 \\ -3 \end{bmatrix}, \begin{bmatrix} 5 \\ 13 \\ -15 \end{bmatrix} \right\}$

C) $\left\{ \begin{bmatrix} 2 \\ 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} \frac{29}{3} \\ 0 \\ -\frac{4}{3} \\ 1 \end{bmatrix} \right\}$

D) $\left\{ \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix} \right\}$

Answer: B

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

A) $\left\{ \begin{bmatrix} 1 \\ 0 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} -5 \\ 4 \\ 0 \\ 0 \end{bmatrix} \right\}$

B) $\left\{ \begin{bmatrix} 1 \\ 0 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 0 \\ 0 \end{bmatrix} \right\}$

C) $\left\{ \begin{bmatrix} 5 \\ -4 \\ 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 3 \\ -4 \\ 0 \\ -1 \\ 1 \end{bmatrix} \right\}$

D) $\left\{ \begin{bmatrix} 1 \\ 0 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ 1 \\ 0 \end{bmatrix} \right\}$

Answer: D

The vector x is in a subspace H with a basis $\beta = \{b_1, b_2\}$. Find the β–coordinate vector of x.

80) $\mathbf{b}_1 = \begin{bmatrix} 1 \\ -2 \end{bmatrix}, \mathbf{b}_2 = \begin{bmatrix} -5 \\ 3 \end{bmatrix}, \mathbf{x} = \begin{bmatrix} 22 \\ -16 \end{bmatrix}$

A) $\begin{bmatrix} 2 \\ -4 \end{bmatrix}$

B) $\begin{bmatrix} -2 \\ 4 \end{bmatrix}$

C) $\begin{bmatrix} -4 \\ 1 \end{bmatrix}$

D) $\begin{bmatrix} -4 \\ 2 \end{bmatrix}$

Answer: A

81) $\mathbf{b}_1 = \begin{bmatrix} 2 \\ -2 \\ 4 \end{bmatrix}, \mathbf{b}_2 = \begin{bmatrix} 6 \\ 1 \\ -3 \end{bmatrix}, \mathbf{x} = \begin{bmatrix} 6 \\ 8 \\ -18 \end{bmatrix}$

A) $\begin{bmatrix} -3 \\ 2 \end{bmatrix}$

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

C) $\begin{bmatrix} 3 \\ -2 \end{bmatrix}$

D) $\begin{bmatrix} 2 \\ -3 \end{bmatrix}$

Answer: A

Determine the rank of the matrix.

82) $\begin{bmatrix} 1 & -2 & 2 & -3 \\ 2 & -4 & 7 & -2 \\ -3 & 6 & -6 & 9 \end{bmatrix}$

A) 4 B) 1 C) 3 D) 2

Answer: D

83) $\begin{bmatrix} 1 & 0 & -4 & 0 & 4 \\ 0 & 1 & -3 & 0 & 4 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$

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

Answer: A