

A Matrix Review

Complete all of the following without a calculator. In problems 1-21, use the following matrices.

$$A = \begin{bmatrix} 1 & -5 \\ 4 & 0 \end{bmatrix} \quad B = \begin{bmatrix} 0 & -3 \\ 6 & -2 \end{bmatrix} \quad C = \begin{bmatrix} -1 & 0 & 2 \\ 5 & 3 & 0 \end{bmatrix} \quad D = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \quad E = \begin{bmatrix} 4 & -2 \\ 2 & 3 \\ 1 & 0 \end{bmatrix}$$

1. Find the dimensions of matrices A , C , and E .
2. Find $A_{2,1}$, $C_{1,3}$, and $E_{2,2}$.
3. Find the entry of matrix C that is in the second row and the third column.
4. Find $A + B$
5. Find $A - B$
6. Find $B - A$
7. Find $2A - 3B$
8. Find $C + E$
9. Find $A \times B$
10. Find $B \times A$
11. Find $B \times C$
12. Find $C \times E$
13. Find $E \times C$
14. Find $C \times A$
15. Find $A \times D$
16. Find $D \times B$
17. Find $\det(A)$
18. Find $\det(B)$
19. Find the inverse of B
20. Find A^{-1}
21. Find C^{-1}

In 22-28 answer true or false.

22. Matrix addition is commutative. -----
23. Matrix subtraction is commutative. -----
24. Matrix multiplication is commutative. -----
25. $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ is called the identity matrix. -----

26. The product of any matrix and its inverse is the identity matrix. -----
27. The product of a 2×1 matrix and a 1×2 matrix is a 2×2 matrix. -----
28. The coefficient matrix for the system of equations $\begin{cases} 3x + 2y = 5 \\ 4x - y = 7 \end{cases}$ is $\begin{bmatrix} 3 & 2 \\ 4 & 1 \end{bmatrix}$

In 29-34, solve the given systems using matrices.

29. $\begin{cases} 2x + 2y = 6 \\ 4x + 5y = 14 \end{cases}$

32. $\begin{cases} x - y = -1 \\ -3x - 5y = 11 \end{cases}$

30. $\begin{cases} x + y = 4 \\ 3x + 2y = 11 \end{cases}$

33. $\begin{cases} 4x + y = 4 \\ 10x + 3y = 11 \end{cases}$

31. $\begin{cases} 2x - y = -13 \\ -3x - 2y = -5 \end{cases}$

34. $\begin{cases} 3x + y = -\frac{3}{4} \\ 2x - 5y = -\frac{19}{4} \end{cases}$

35. Explain how to determine whether or not matrices can be multiplied. Use complete sentences.

36. Explain Cramer's Rule.

Matrices and Calculators

Use your calculator to solve each of the following. First enter the matrices in the matrix editor. For any problem that generates an error, write a description of why, mathematically, an error was generated.

$$A = \begin{bmatrix} -2 & 1 & 3 \\ 4 & 0 & -1 \end{bmatrix} \quad B = \begin{bmatrix} 4 & 1 & -2 \\ 5 & -1 & 3 \end{bmatrix} \quad C = \begin{bmatrix} 2 & -1 \\ 0 & 6 \\ -3 & 2 \end{bmatrix} \quad D = \begin{bmatrix} -4 & 2 \\ 3 & 5 \\ -1 & -3 \end{bmatrix}$$

1. $3A$

9. $(2A)(5C)$

2. $0B$

10. $(5D)(4B)$

3. $A + B$

11. A^2

4. $B + C$

12. $(AC)^2$

5. $C - D$

13. $(2A - B)D$

6. $4A - 2B$

14. ADB

7. AB

15. $(A^T)A$

8. $(CD)^T$

16. BC and CB