Determine the order of each matrix.

1. $\begin{bmatrix} -3 \\ 1 \\ 10 \end{bmatrix}$ **2.** $\begin{bmatrix} 3 & -1 & 0 & 6 \\ -2 & 7 & 1 & 4 \end{bmatrix}$

3. $[14]$ **4.** $\begin{bmatrix} 6 & 7 & -5 & 0 & -8 \end{bmatrix}$

Identify the indicated entry.

5. $\begin{bmatrix} 8 & 4 \\ -1 & 6 \\ 0 & 11 \\ 12 & 9 \end{bmatrix}$ **6.** $\begin{bmatrix} -1 & 0 & 5 \\ 2 & 3 & 20 \end{bmatrix}$

Find a_{32}.   Find a_{21}.

Add, subtract, and multiply by scalars. If not possible, indicate so.

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

8. $\begin{bmatrix} 7 & 3 \\ -1 & 5 \end{bmatrix} + \begin{bmatrix} 10 & -20 \\ 14 & -3 \end{bmatrix}$

9. $\begin{bmatrix} -11 & 16 & 19 \\ -7 & -2 & 1 \end{bmatrix} - \begin{bmatrix} 6 & 0 \\ 8 & -4 \\ -2 & 10 \end{bmatrix}$

10. If $A = \begin{bmatrix} -2 & -1 \\ 1 & 0 \\ 3 & -4 \end{bmatrix}$ and $\begin{bmatrix} 0 & 3 \\ 3 & 0 \\ -4 & -1 \end{bmatrix}$,

find $2A + 4B$.

Multiply, if possible.

11. $\begin{bmatrix} 1 & 2 \\ 5 & -4 \\ 6 & 0 \end{bmatrix}\begin{bmatrix} 6 & -2 & 8 \\ 4 & 0 & 0 \end{bmatrix}$

12. $\begin{bmatrix} 1 & 5 & 6 \\ 2 & -4 & 0 \end{bmatrix}\begin{bmatrix} 6 & -2 & 8 \\ 4 & 0 & 0 \end{bmatrix}$

Find the determinant, using the formula.

13. $\begin{bmatrix} 8 & 5 \\ 2 & -4 \end{bmatrix}$ **14.** $\begin{bmatrix} 5 & 0 & -3 \\ 0 & 12 & 4 \\ 1 & 6 & 3 \end{bmatrix}$

Find the inverse, using the formula.

15. $\begin{bmatrix} 10 & 4 \\ 7 & 3 \end{bmatrix}$

Verify that A and B are inverses.

16. $A = \begin{bmatrix} -4 & -1 \\ 7 & 2 \end{bmatrix}$, $B = \begin{bmatrix} -2 & -1 \\ 7 & 4 \end{bmatrix}$

Find the inverse, using the calculator.

17. $\begin{bmatrix} 10 & -5 & 5 \\ 30 & 0 & 10 \\ 0 & 10 & 1 \end{bmatrix}$

Use matrices to find the solutions to the systems of equations.

18. $\begin{cases} -3x + 10y = 8 \\ 5x - 17y = -13 \end{cases}$

19. $\begin{cases} 3x + 2y - z = 6 \\ x - y + 2z = -1 \\ 5x + y + z = 7 \end{cases}$

Use Cramer's rule to solve the equation for z.

20. $\begin{cases} -x + 4y - 2z = 12 \\ 2x - 9y + 5z = -25 \\ -x + 5y - 4z = 10 \end{cases}$

Determine if the points given are collinear.

21. $(-1, 7), (3, -9), (-3, 15)$

22. $(9, -10), (4, -1), (1, 5)$

Find the area of the triangle with given vertices.

23. $(-4, 0), (4, 0), (0, 6)$

24. $\left(\frac{1}{2}, 1\right), \left(2, -\frac{5}{2}\right), \left(\frac{3}{2}, 1\right)$

Find a value of x such that the triangle with given vertices that has an area of 4.

25. $(-5, 1) (0, 2) (-2, x)$

26. $(-4, 2) (-3, 5) (-1, x)$

Solve for x.

27. $\begin{vmatrix} x - 1 & 2 \\ 3 & x - 2 \end{vmatrix} = 0$

28. $\begin{vmatrix} x - 2 & -1 \\ -3 & x \end{vmatrix} = 0$

Solve the word problems using matrices. Label the rows and columns of the created matrices and show your work.

29.

Mixture Problem A florist wants to arrange a dozen flowers consisting of two varieties: carnations and roses. Carnations cost $0.75 each and roses cost $1.50 each. How many of each should the florist use so that the arrangement will cost $12.00?

30.

Break-Even Point A business invests $25,000 in equipment to produce a product. Each unit of the product costs $3.75 to produce and is sold for $5.25. How many items must be sold before the business breaks even?

31.

Manufacturing A manufacturing company produces three models of a product that are shipped to two warehouses. The number of units of model i that are shipped to warehouse j is represented by a_{ij} in the matrix

$$A = \begin{bmatrix} 8200 & 7400 \\ 6500 & 9800 \\ 5400 & 4800 \end{bmatrix}.$$

The price per unit is represented by the matrix $B = [\$10.25 \quad \$14.50 \quad \$17.75]$.

Use a graphing utility to compute BA and interpret the result.

Use the following vertex-edge graph to answer the questions below.
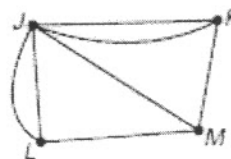
31. Write a matrix to represent the vertex-edge graph.

32. Calculate A^2.

33. Use the matrix, **A**, to find the number of ways you can travel between the towns J and M using 2 roads.