

Name _____ Class _____ Date _____

Practice 4-3**Matrix Multiplication**

Use matrices A , B , C , D , and E to find each product, sum, or difference, if possible. If not possible, write *product undefined*, *sum undefined*, or *difference undefined*.

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

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|------------|--------------------|-------------|-------------|-------------|
| 1. $3AB$ | 2. $2A + 4D$ | 3. $5D - A$ | 4. $2C - E$ | 5. $3D + A$ |
| 6. DA | 7. AE | 8. BD | 9. DB | 10. CE |
| 11. DC | 12. EB | 13. CB | 14. $2D$ | 15. BE |
| 16. $0.2B$ | 17. $\frac{1}{4}C$ | 18. $0.5AC$ | 19. DE | 20. $-3DE$ |

Find the dimensions of the product matrix. Then find each product.

21. $\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} [1 \ 2 \ 3 \ 4]$	22. $\begin{bmatrix} 1 & 2 & 12 \\ 12 & 2 & 1 \end{bmatrix} \begin{bmatrix} 3 & 4 \\ 4 & 3 \\ 5 & 2 \end{bmatrix}$	23. $\begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix} \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$
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Find each product if possible. If not possible, write *product undefined*.

24. $-12 \begin{bmatrix} -6 & -2 \\ -5 & -6 \\ 0 & 1 \end{bmatrix}$	25. $\begin{bmatrix} 3 & 2 \\ 4 & 6 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} -3 & 3 & -2 \\ -2 & 5 & -1 \end{bmatrix}$
26. $\begin{bmatrix} 0 & 1 & 0 \\ 2 & 2 & 1 \end{bmatrix} \begin{bmatrix} -2 & 2 & 2 \\ -1 & 1 & 1 \\ 0 & -1 & -1 \end{bmatrix}$	27. $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix} \begin{bmatrix} 2 & 3 \\ 4 & 1 \\ 5 & 6 \end{bmatrix}$
28. $\begin{bmatrix} 1 & 0 & 1 \\ 1 & 1 & 0 \\ 1 & 1 & 1 \end{bmatrix} \begin{bmatrix} 6 & 4 & 2 & 8 \\ 10 & 4 & 6 & 2 \\ 2 & 10 & 12 & 4 \end{bmatrix}$	29. $\begin{bmatrix} 4 & 3 \\ 9 & 7 \end{bmatrix} \begin{bmatrix} 6 & 3 \\ 9 & 4 \end{bmatrix}$

Solve each equation. Check your answers.

30. $2 \begin{bmatrix} 0 & 1 \\ 3 & -4 \end{bmatrix} - 3X = \begin{bmatrix} 9 & -6 \\ 1 & -2 \end{bmatrix}$	31. $\frac{1}{2}X + \begin{bmatrix} 5 & -1 \\ 0 & \frac{2}{3} \end{bmatrix} = 2 \begin{bmatrix} 3 & 0 \\ 1 & 2 \end{bmatrix}$
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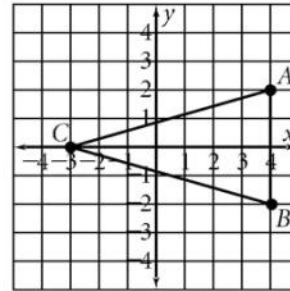
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Practice 4-4**Geometric Transformations With Matrices**

For Exercises 1–11, use $\triangle ABC$ at the right. Find the coordinates of the image under each transformation. Express your answer as a matrix.

- a dilation of 11
- a translation 1 unit right and 4 units up
- a dilation of 1.5
- a translation 2 units right and 6 units down
- a reflection in $y = x$
- a rotation of 270°
- a rotation of 90°
- a translation 1 unit left and 2 units down
- a translation 3 units left and 1 unit up
- a dilation of $\frac{1}{2}$
- a reflection in the x -axis



Graph each figure and its image after the given transformation.

- $\begin{bmatrix} 2 & -3 & 6 & 4 \\ 0 & 1 & 1 & -4 \end{bmatrix}$; a dilation of 2
- $\begin{bmatrix} 8 & 3 & -2 & -5 & 2 \\ 7 & 6 & 1 & 0 & -4 \end{bmatrix}$; a translation 2 units left and 1 unit up
- $\begin{bmatrix} 2 & 4 & 5 & 3 \\ 1 & 1 & 3 & 5 \end{bmatrix}$; a translation 5 units left and 4 units down
- $\begin{bmatrix} 2 & 1 & 6 & -4 \\ 0 & -3 & 5 & -2 \end{bmatrix}$; a rotation of 180°
- $\begin{bmatrix} 6 & 5 & 1 & -3 & 6 \\ -1 & 6 & 2 & 0 & -4 \end{bmatrix}$; a reflection in the y -axis

The coordinates of the vertices of a polygon are given. Represent each transformation with matrices. Then express the coordinates of the vertices of the image as a matrix.

- $I(21, -14), J(0, -7), K(-14, 0), L(0, 7)$; a dilation of $\frac{1}{7}$
- $M(2, 0), N(0, -2), P(-2, 0)$; a translation 2 units down
- $Q(2, 0), R(0, -2), S(-2, 0)$; a reflection in $y = -x$

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