

12.2 Practice – Matrix Multiplication

Algebra 2 – NO GRAPHING CALCULATOR

Name: Solutions

For 1-6, find the product of the two matrices. Box your final answer.

<p>1) $\begin{bmatrix} 4 & -6 \\ 6 & 2 \end{bmatrix} \cdot \begin{bmatrix} 3 & 6 \\ -6 & 1 \end{bmatrix} = \begin{bmatrix} C_{11} & C_{12} \\ C_{21} & C_{22} \end{bmatrix}$</p> <p>$C_{1,1} = (4)(3) + (-6)(-6) = 12 + 36 = 48$ $C_{1,2} = (4)(6) + (-6)(1) = 24 - 6 = 18$ $C_{2,1} = (6)(3) + (2)(-6) = 18 - 12 = 6$ $C_{2,2} = (6)(6) + (2)(1) = 36 + 2 = 38$</p> <p>$\begin{bmatrix} 48 & 18 \\ 6 & 38 \end{bmatrix}$</p>	<p>2) $\begin{bmatrix} -2 & -5 \\ -6 & 1 \end{bmatrix} \cdot \begin{bmatrix} -4 & -4 \\ 5 & 0 \end{bmatrix} = \begin{bmatrix} C_{11} & C_{12} \\ C_{21} & C_{22} \end{bmatrix}$</p> <p>$C_{1,1} = (-2)(-4) + (-5)(5) = 8 - 25 = -17$ $C_{1,2} = (-2)(-4) + (-5)(0) = 8 + 0 = 8$ $C_{2,1} = (-6)(-4) + (1)(5) = 24 + 5 = 29$ $C_{2,2} = (-6)(-4) + (1)(0) = 24 + 0 = 24$</p> <p>$\begin{bmatrix} -17 & 8 \\ 29 & 24 \end{bmatrix}$</p>	<p>3) $[7 \ 3 \ -1] \cdot \begin{bmatrix} 4 & -9 \\ 0 & 2 \\ 5 & -4 \end{bmatrix} = \begin{bmatrix} C_{11} & C_{12} \end{bmatrix}$</p> <p>$C_{11} = (7)(4) + (3)(0) + (-1)(5) = 28 + 0 - 5 = 23$ $C_{12} = (7)(-9) + (3)(2) + (-1)(-4) = -63 + 6 + 4 = -53$</p> <p>$\begin{bmatrix} 23 & -53 \end{bmatrix}$</p>
<p>4) $\begin{bmatrix} 5 & -1 \\ 0 & -2 \\ 2 & 6 \end{bmatrix} \cdot \begin{bmatrix} -2 \\ 2 \end{bmatrix} = \begin{bmatrix} C_{1,1} \\ C_{2,1} \\ C_{3,1} \end{bmatrix}$</p> <p>$C_{1,1} = (5)(-2) + (-1)(2) = -10 - 2 = -12$ $C_{2,1} = (0)(-2) + (-2)(2) = 0 - 4 = -4$ $C_{3,1} = (2)(-2) + (6)(2) = -4 + 12 = 8$</p> <p>$\begin{bmatrix} -12 \\ -4 \\ 8 \end{bmatrix}$</p>	<p>5) $\begin{bmatrix} 5 & 6 & -2 \\ 0 & 3 & 0 \end{bmatrix} \cdot \begin{bmatrix} -6 & 1 \\ 6 & -4 \\ 1 & 1 \end{bmatrix} = \begin{bmatrix} C_{11} & C_{12} \\ C_{21} & C_{22} \end{bmatrix}$</p> <p>$C_{1,1} = (5)(-6) + (6)(6) + (-2)(1) = -30 + 36 - 2 = 4$ $C_{1,2} = (5)(1) + (6)(-4) + (-2)(1) = 5 - 24 - 2 = -21$ $C_{2,1} = (0)(-6) + (3)(6) + (0)(1) = 0 + 18 + 0 = 18$ $C_{2,2} = (0)(1) + (3)(-4) + (0)(1) = 0 - 12 + 0 = -12$</p> <p>$\begin{bmatrix} 4 & -21 \\ 18 & -12 \end{bmatrix}$</p>	<p>6) $\begin{bmatrix} -2 & -5 \\ 4 & 3 \\ -3 & -4 \end{bmatrix} \cdot \begin{bmatrix} -2 & -6 \\ -6 & -5 \end{bmatrix} = \begin{bmatrix} C_{11} & C_{12} \\ C_{21} & C_{22} \\ C_{31} & C_{32} \end{bmatrix}$</p> <p>$C_{1,1} = (-2)(-2) + (-5)(-6) = 4 + 30 = 34$ $C_{1,2} = (-2)(-6) + (-5)(-5) = 12 + 25 = 37$ $C_{2,1} = (4)(-2) + (3)(-6) = -8 - 18 = -26$ $C_{2,2} = (4)(-6) + (3)(-5) = -24 - 15 = -39$ $C_{3,1} = (-3)(-2) + (-4)(-6) = 6 + 24 = 30$ $C_{3,2} = (-3)(-6) + (-4)(-5) = 18 + 20 = 38$</p> <p>$\begin{bmatrix} 34 & 37 \\ -26 & -39 \\ 30 & 38 \end{bmatrix}$</p>

For 7-10, the dimensions of Matrix A and Matrix B are listed. What are the dimensions of the product of AB? If it is not possible, then write "undefined."

<p>7) Matrix A: 6 x 2 Matrix B: 2 x 3</p> <p>Matrix AB: <u>6</u> x <u>3</u></p>	<p>8) Matrix A: 3 x <u>1</u> Matrix B: <u>5</u> x 1</p> <p>Matrix AB: <u>Undefined</u></p>	<p>9) Matrix A: 6 x 7 Matrix B: 7 x 4</p> <p>Matrix AB: <u>6</u> x <u>4</u></p>	<p>10) Matrix A: 4 x 2 Matrix B: 2 x 1</p> <p>Matrix AB: <u>4</u> x <u>1</u></p>
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For 11-12, solve for the variables x and y .

$$11). \begin{bmatrix} 4 & -3 \\ 4 & 5 \end{bmatrix} \cdot \begin{bmatrix} x & y \\ -3 & 2 \end{bmatrix} = \begin{bmatrix} 13 & 14 \\ -11 & 30 \end{bmatrix}$$

$$(4)(x) + (-3)(-3) = 13$$

$$4x + 9 = 13$$

$$4x = 4$$

$$x = 1$$

$$(4)(y) + (5)(2) = 30$$

$$4y + 10 = 30$$

$$4y = 20$$

$$y = 5$$

$$12). \begin{bmatrix} -3 & -5 \\ y & -2 \end{bmatrix} \cdot \begin{bmatrix} -1 & -2 \\ -5 & x \end{bmatrix} = \begin{bmatrix} 28 & 6 \\ 12 & 4 \end{bmatrix}$$

$$(-3)(-2) + (-5)(x) = 6$$

$$6 - 5x = 6$$

$$-5x = 0$$

$$x = 0$$

$$(y)(-1) + (-2)(-5) = 12$$

$$-y + 10 = 12$$

$$-y = 2$$

$$y = -2$$