NAME Key DATE PERIOD

4.2 Multiplying Matrices

Self Discovery Lesson: I can multiply matrices

KEY TO LEARNING:

Multiply Matrices You can multiply two matrices if and only if the number of columns in the first matrix is equal to the number of rows in the second matrix.

Multiplication of Matrices	$A \cdot B = AB$ $\begin{bmatrix} a & b \\ c & d \end{bmatrix} \cdot \begin{bmatrix} e & f \\ g & h \end{bmatrix} = \begin{bmatrix} ae + bg & af + bh \\ ce + dg & cf + dh \end{bmatrix}$

Example: Find AB if $A = \begin{bmatrix} -4 & 3 \\ 2 & -2 \\ 1 & 7 \end{bmatrix}$ and $B = \begin{bmatrix} 5 & -2 \\ -1 & 3 \end{bmatrix}$

$AB = \begin{bmatrix} -4 & 3 \\ 2 & -2 \\ 1 & 7 \end{bmatrix} \cdot \begin{bmatrix} 5 & -2 \\ -1 & 3 \end{bmatrix}$ Substitution

$= \begin{bmatrix} -4(5) + 3(-1) & -4(-2) + 3(3) \\ 2(5) + (-2)(-1) & 2(-2) + (-2)(3) \\ 1(5) + 7(-1) & 1(-2) + 7(3) \end{bmatrix}$ Multiply row of 1st matrix by column of 2nd matrix.

$= \begin{bmatrix} -23 & 17 \\ 12 & -10 \\ -2 & 19 \end{bmatrix}$ Simplify.

Exercises

Find each product, if possible.

1. $\begin{bmatrix} 4 & 1 \\ -2 & 3 \end{bmatrix} \cdot \begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix} = \boxed{\begin{bmatrix} 12 & 3 \\ -6 & 9 \end{bmatrix}}$

   2x2 2x2

2. $\begin{bmatrix} -1 & 0 \\ 3 & 7 \end{bmatrix} \cdot \begin{bmatrix} 3 & 2 \\ -1 & 4 \end{bmatrix} = \begin{bmatrix} -3+0 & -2+0 \\ -3 & -2 \\ 9+-7 & 6+28 \\ 2 & 34 \end{bmatrix} = \boxed{\begin{bmatrix} -3 & -2 \\ 2 & 34 \end{bmatrix}}$

   2x2 2x2

3. $\begin{bmatrix} -3 & 1 \\ 5 & -2 \end{bmatrix} \cdot \begin{bmatrix} 4 & 0 & -2 \\ -3 & 1 & 1 \end{bmatrix} = \begin{bmatrix} -12+-3 & 0+1 & 6+1 \\ 20+6 & 0-2 & -10-2 \end{bmatrix}$

   2x2 2x3 2x3

   $\boxed{\begin{bmatrix} -15 & 1 & 7 \\ 26 & -2 & -12 \end{bmatrix}}$

4. $\begin{bmatrix} 3 & -2 \\ 0 & 4 \\ -5 & 1 \end{bmatrix} \cdot \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix} = \begin{bmatrix} 3-4 & 6-2 \\ 0+8 & 0+4 \\ -5+2 & -10+1 \end{bmatrix} = \boxed{\begin{bmatrix} -1 & 4 \\ 8 & 4 \\ -3 & -9 \end{bmatrix}}$

   3x2 2x2 3x2

5. $\begin{bmatrix} 6 & 10 \\ -4 & 3 \\ -2 & 7 \end{bmatrix} \cdot [0 \ 4 \ -3]$

   3x2 1x3

   N.P

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

   3x3 2x2

   N.P