

# Honors Algebra 2 Notes

Name \_\_\_\_\_

## 3.6 Multiplying Matrices

- ❖ To Multiply 2 matrices the number of columns of the 1<sup>st</sup> matrix must equal the number of rows of the 2<sup>nd</sup> matrix
- ❖ To Multiply matrix  $A_{m \times n}$  with matrix  $B_{n \times p}$  the product matrix will have the dimensions  $m \times p$  # columns = # rows
- ❖ Process of Multiplying Matrices: To find the individual elements of the product matrix, multiply the corresponding elements of each row of A by the corresponding elements of each column of B and add the products.

$$\begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix} \times \begin{bmatrix} -2 & 1 \\ -6 & 8 \end{bmatrix} = \begin{bmatrix} (2)(-2) + (3)(-6) & (2)(1) + (3)(8) \\ (4)(-2) + (5)(-6) & (4)(1) + (5)(8) \end{bmatrix} = \begin{bmatrix} -22 & 26 \\ -38 & 44 \end{bmatrix}$$

Use the given matrices and perform the indicated operations, if possible:

$$A = \begin{bmatrix} 3 & 4 \\ 5 & 6 \end{bmatrix} \quad B = \begin{bmatrix} -3 & -4 & -5 \\ -1 & -2 & -3 \end{bmatrix} \quad C = \begin{bmatrix} 6 & 8 & 10 \\ 10 & 4 & 2 \\ -3 & 0 & -5 \end{bmatrix} \quad D = \begin{bmatrix} 3 & 6 \\ 9 & 12 \end{bmatrix}$$

<p>1. <math>AB \rightarrow (2 \times 3)</math> <math>(2 \times 2) \cdot (2 \times 3)</math></p> $\begin{bmatrix} 3 & 4 \\ 5 & 6 \end{bmatrix} \cdot \begin{bmatrix} -3 & -4 & -5 \\ -1 & -2 & -3 \end{bmatrix}$ $= \begin{bmatrix} -9-4 & -12-8 & -15-12 \\ -15-6 & -20-12 & -25-18 \end{bmatrix}$ $= \begin{bmatrix} -13 & -20 & -27 \\ -21 & -32 & -43 \end{bmatrix}$	<p>2. <math>DA \rightarrow (2 \times 2)</math> <math>(2 \times 2) \cdot (2 \times 2)</math></p> $\begin{bmatrix} 3 & 6 \\ 9 & 12 \end{bmatrix} \cdot \begin{bmatrix} 3 & 4 \\ 5 & 6 \end{bmatrix}$ $= \begin{bmatrix} 9+30 & 12+36 \\ 27+60 & 36+72 \end{bmatrix}$ $= \begin{bmatrix} 39 & 48 \\ 87 & 108 \end{bmatrix}$	<p>3. <math>DB \rightarrow (2 \times 3)</math> <math>(2 \times 2) \cdot (2 \times 3)</math></p> $\begin{bmatrix} 3 & 6 \\ 9 & 12 \end{bmatrix} \cdot \begin{bmatrix} -3 & -4 & -5 \\ -1 & -2 & -3 \end{bmatrix}$ $= \begin{bmatrix} -9-6 & -12-12 & -15-18 \\ -27-12 & -36-24 & -45-36 \end{bmatrix}$ $= \begin{bmatrix} -15 & -24 & -33 \\ -39 & -60 & -81 \end{bmatrix}$
<p>* What is <math>AB_{2,3}</math>? = -43</p>	<p>* What is <math>DA_{1,2}</math>? = 48</p>	<p>* What is <math>DB_{1,3}</math>? = -33</p>
<p>4. <math>BD</math> <math>(2 \times 3)(2 \times 2)</math></p> <p>Not Possible b/c columns of B <math>\neq</math> rows of D</p> <p>* <math>DB \neq BD</math> Multiplication is not commutative for matrices</p>	<p>5. <math>\frac{1}{3}DB - AB</math> <math>(2 \times 3) + (2 \times 3)</math></p> $\frac{1}{3} \begin{bmatrix} -15 & -24 & -33 \\ -39 & -60 & -81 \end{bmatrix} - \begin{bmatrix} -13 & -20 & -27 \\ -21 & -32 & -43 \end{bmatrix}$ $= \begin{bmatrix} -5 & -8 & -11 \\ -13 & -20 & -27 \end{bmatrix} + \begin{bmatrix} 13 & 20 & 27 \\ 21 & 32 & 43 \end{bmatrix}$ $= \begin{bmatrix} 8 & 12 & 16 \\ 8 & 12 & 16 \end{bmatrix}$	<p>6. <math>DA + DB</math> <math>(2 \times 2) + (2 \times 3)</math></p> <p>Not possible b/c the dimensions are different!</p>