

Name: \_\_\_\_\_

## Multiplying Matrices

1) Let

$$A = \begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix} \text{ and } B = \begin{bmatrix} 2 & 3 & 0 \\ 3 & 4 & 6 \end{bmatrix}$$

Find if possible:

(1)  $AB$ (2)  $BA$ 

2) Find each product if possible

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

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

3)  $\begin{bmatrix} 4 & 0 & 2 \end{bmatrix} \cdot \begin{bmatrix} 1 \\ 3 \\ -1 \end{bmatrix}$

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

5)  $\begin{bmatrix} 3 & -2 & 7 \\ 6 & 0 & -5 \end{bmatrix} \cdot \begin{bmatrix} 3 & -2 & 7 \\ 6 & 0 & -5 \end{bmatrix}$

- 3) Use  $A = \begin{bmatrix} 1 & 3 \\ 3 & 1 \end{bmatrix}$ ,  $B = \begin{bmatrix} 4 & 0 \\ -2 & -1 \end{bmatrix}$ ,  $C = \begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$ , and scalar  $c=3$  to determine whether the following equations are true for the given matrices:

1)  $AC = CA$

2)  $A(B+C) = BA+CA$

3)  $(AB)c = c(AB)$

4)  $(A+C)B = B(A+C)$

- 4) Given  $A = \begin{bmatrix} 1 & -9 & 7 \\ 5 & 1 & 9 \\ -5 & -4 & 1 \\ 7 & -6 & -4 \end{bmatrix}$  and  $B = \begin{bmatrix} 1 & 5 \\ 5 & 10 \\ 1 & 9 \end{bmatrix}$ , compute  $A \bullet B$  and  $B \bullet A$  if possible

- 5) Given  $A = \begin{bmatrix} 7 & -6 \\ 6 & 1 \end{bmatrix}$  and  $B = \begin{bmatrix} 10 & 8 \\ 5 & 7 \end{bmatrix}$ , compute  $A \bullet B$  and  $B \bullet A$  if possible

- 6) Given  $A = \begin{bmatrix} -3 \\ 9 \\ -2 \end{bmatrix}$  and  $B = [4 \ 7 \ -2]$ , compute  $A \bullet B$  and  $B \bullet A$  if possible

- 7) Given  $A = \begin{bmatrix} -2 & 3 & 9 \\ 2 & -8 & -1 \\ 0 & -9 & -2 \end{bmatrix}$  and  $B = \begin{bmatrix} 7 & -75 & 69 \\ 4 & 4 & 16 \\ -18 & -18 & 10 \end{bmatrix}$ , compute  $A \bullet B$  and  $B \bullet A$  if possible

- 8) Given  $A = \begin{bmatrix} -1 & -3 & -4 \\ 10 & -2 & 5 \\ 3 & 5 & 3 \end{bmatrix}$  and  $B = \begin{bmatrix} -7 & 6 & 8 \\ 2 & 5 & 7 \\ -8 & 10 & -3 \end{bmatrix}$ , compute  $A \bullet B$  and  $B \bullet A$  if possible

- 9) Given  $A = \begin{bmatrix} -6 & -4 & 5 \\ 8 & 7 & -3 \end{bmatrix}$ ,  $B = \begin{bmatrix} 3 & -4 & -2 & 8 \\ 7 & 5 & 6 & -9 \\ -2 & 1 & 0 & 4 \end{bmatrix}$  and  $C = \begin{bmatrix} -7 & 1 \\ 2 & -8 \\ -6 & 5 \\ 0 & 9 \end{bmatrix}$ , find the product  $A \bullet B \bullet C$  if

possible in two different ways. First multiply  $B$  by  $C$  to form  $B \bullet C$ , and then multiply this from the left to get  $A \bullet B \bullet C$ . Then, multiply  $A$  by  $B$  to get  $A \bullet B$  and then multiply this by  $C$  from the right to get  $A \bullet B \bullet C$ . Compare your two final results.