

## Exercises on Matrix Operations

1. Consider the following matrices

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

- A) Find  $A + B$ .  
B) Find  $AB$ .  
C) Find  $A - 2B$ .  
D) Find  $A^2$ .

2. Consider the following matrices

$$A = \begin{bmatrix} 1 & -1 & 3 \\ 3 & -2 & 6 \\ -1 & 3 & -8 \end{bmatrix} \quad B = \begin{bmatrix} -2 & 1 & -1 \\ 18 & -5 & 3 \\ 7 & -2 & 1 \end{bmatrix}$$

- A) Find  $A + B$ .  
B) Find  $AB$

3. Using the following five matrices Perform each Operation if it is possible

$$A = \begin{bmatrix} 2 & 0 & 3 \end{bmatrix}, B = \begin{bmatrix} 0 & 2 \\ -3 & 1 \end{bmatrix}, C = \begin{bmatrix} 1 & 0 \\ 0 & 1 \\ 2 & -2 \end{bmatrix}, D = \begin{bmatrix} 3 \\ 5 \end{bmatrix}, \text{ and } E = \begin{bmatrix} 1 & 1 & -1 \\ 3 & 0 & 4 \end{bmatrix}$$

- A)  $AC$                       C)  $DAC$                       E)  $BD+2B$   
B)  $CB - C$                   D)  $(CE)^2$

4. Find the inverse of the following matrix [if it exists].

$$A = \begin{bmatrix} 1 & -1 & 1 \\ -2 & 3 & -3 \\ 3 & 0 & 1 \end{bmatrix}$$

5. Suppose the matrix B is a 3x3 matrix such that  $BA = C$ , where A and C are given by:

$$A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 2 \\ 0 & 1 & 3 \end{bmatrix}, \text{ and } C = \begin{bmatrix} 2 & 0 & 1 \\ -1 & 2 & 3 \\ 0 & 1 & 2 \end{bmatrix}$$

Find  $B$ .

6. A system of equations  $AX = B$  is given by:

$$A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 1 & -2 \\ 2 & 0 & 5 \end{bmatrix}, \quad X = \begin{bmatrix} x \\ y \\ z \end{bmatrix}, \text{ and } B = \begin{bmatrix} 2 \\ 4 \\ -1 \end{bmatrix}.$$

Solve the system by finding inverse of an appropriate matrix.