NAME: ____________________ PERIOD: ____________________ DATE: ______________

Homework Problem Set

For the matrices given below, perform each of the following calculations or explain why the calculation is not possible.

$$A = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix} \qquad B = \begin{bmatrix} 2 & 1 \\ -1 & 4 \end{bmatrix}$$

$$C = \begin{bmatrix} 5 & 2 & 9 \\ 6 & 1 & 3 \\ -1 & 1 & 0 \end{bmatrix} \qquad D = \begin{bmatrix} 1 & 6 & 0 \\ 3 & 0 & 2 \\ 1 & 3 & -2 \end{bmatrix}$$

1. $A + B$ $\begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix} + \begin{bmatrix} 2 & 1 \\ -1 & 4 \end{bmatrix} = \boxed{\begin{bmatrix} 3 & 3 \\ -1 & 5 \end{bmatrix}}$	2. $2A - B$ $\begin{bmatrix} 2 & 4 \\ 0 & 2 \end{bmatrix} + \begin{bmatrix} 2 & 1 \\ -1 & 4 \end{bmatrix} = \boxed{\begin{bmatrix} 0 & 3 \\ 1 & -2 \end{bmatrix}}$
3. $A + C$ Not Possible These 2 matrices cannot be added since they are different dimensions	4. $-2C$ $-2\begin{bmatrix} 5 & 2 & 9 \\ 6 & 1 & 3 \\ -1 & 1 & 0 \end{bmatrix} = \boxed{\begin{bmatrix} -10 & -4 & -18 \\ -12 & -2 & -6 \\ 2 & -2 & 0 \end{bmatrix}}$
5. $4D - 2C$ $\begin{bmatrix} 4 & 24 & 0 \\ 12 & 0 & 8 \\ 4 & 12 & -8 \end{bmatrix} - \begin{bmatrix} 10 & 4 & 18 \\ 12 & 2 & 6 \\ -2 & 2 & 0 \end{bmatrix} = \boxed{\begin{bmatrix} -6 & 20 & -18 \\ 0 & -2 & 2 \\ 6 & 10 & -8 \end{bmatrix}}$	6. $3B - 3B$ $\begin{bmatrix} 6 & 3 \\ -3 & 12 \end{bmatrix} + \begin{bmatrix} 6 & 3 \\ -3 & 12 \end{bmatrix} = \boxed{\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}}$
7. $5B - C$ Not Possible These 2 matrices cannot be subtracted since they are different dimensions	8. $B - 3A$ $\begin{bmatrix} 2 & 1 \\ -1 & 4 \end{bmatrix} - \begin{bmatrix} 3 & 6 \\ 0 & 3 \end{bmatrix} = \boxed{\begin{bmatrix} -1 & -5 \\ -1 & 1 \end{bmatrix}}$

9. Let $A = \begin{bmatrix} 3 & \frac{2}{3} \\ -1 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} \frac{1}{2} & \frac{3}{2} \\ 4 & 1 \end{bmatrix}$

A. If $C = 6A + 6B$, determine matrix C.

$C = 6\begin{bmatrix} 3 & \frac{2}{3} \\ -1 & 5 \end{bmatrix} + 6\begin{bmatrix} \frac{1}{2} & \frac{3}{2} \\ 4 & 1 \end{bmatrix}$

$C = \begin{bmatrix} 18 & 4 \\ -6 & 30 \end{bmatrix} + \begin{bmatrix} 3 & 9 \\ 24 & 6 \end{bmatrix} = \boxed{\begin{bmatrix} 21 & 13 \\ 18 & 36 \end{bmatrix}}$

B. If $D = 6(A + B)$, determine matrix D.

$D = 6\left(\begin{bmatrix} 3 & \frac{2}{3} \\ -1 & 5 \end{bmatrix} + \begin{bmatrix} \frac{1}{2} & \frac{3}{2} \\ 4 & 1 \end{bmatrix}\right) \Rightarrow 6\begin{bmatrix} \frac{7}{2} & \frac{13}{6} \\ 3 & 6 \end{bmatrix} \Rightarrow \boxed{\begin{bmatrix} 21 & 13 \\ 18 & 36 \end{bmatrix}}$

C. What is the relationship between matrices C and D? Why do you think that is?

They are the same
multiplying by scalar appears to be distributive.

10. Let $A = \begin{bmatrix} 3 & 2 \\ -1 & 5 \\ 3 & -4 \end{bmatrix}$ and X be a 3×2 matrix. If $A + X = \begin{bmatrix} -2 & 3 \\ 4 & 1 \\ 1 & -5 \end{bmatrix}$, then determine X.

$\begin{bmatrix} 3 & 2 \\ -1 & 5 \\ 3 & -4 \end{bmatrix} + \begin{bmatrix} -5 & 1 \\ 5 & -4 \\ -2 & -1 \end{bmatrix} = \begin{bmatrix} -2 & 3 \\ 4 & 1 \\ 1 & -5 \end{bmatrix}$ $\quad \boxed{X = \begin{bmatrix} -5 & 1 \\ 5 & -4 \\ -2 & -1 \end{bmatrix}}$

11. Let $A = \begin{bmatrix} 1 & 3 & 2 \\ 3 & 1 & 2 \\ 4 & 3 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 1 & 3 \\ 2 & 2 & 1 \\ 1 & 3 & 1 \end{bmatrix}$ represent the bus routes of two companies between three cities.

A. Let $C = A + B$. Find matrix C. Explain what the resulting matrix and entry $c_{1,3}$ mean in this context.

$C = \begin{bmatrix} 3 & 4 & 5 \\ 5 & 3 & 3 \\ 5 & 6 & 3 \end{bmatrix}$

$\boxed{C_{1,3}} \rightarrow$ 5 ways to get from city 1 to city 3 using either bus company

B. Let $D = B + A$. Find matrix D. Explain what the resulting matrix and entry $d_{1,3}$ mean in this context.

$D = \begin{bmatrix} 3 & 4 & 5 \\ 5 & 3 & 3 \\ 5 & 6 & 3 \end{bmatrix}$.

$\boxed{d_{1,3}} \rightarrow$ 5 ways to get from city 1 to city 3 using either bus company

C. What is the relationship between matrices C and D? Why do you think that is?

Matrices C & D are equal.
It doesn't matter the order we add matrices.