Algebra of Matrices Ex 5.2 Q12

Given, $A = \begin{bmatrix} 9 & 1 \\ 7 & 8 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 5 \\ 7 & 12 \end{bmatrix}$

Let, $C = \begin{bmatrix} x & y \\ z & w \end{bmatrix}$

Since, $5A + 3B + 2C$ is a null matrix, so

$5A + 3B + 2C = 0$

$$\Rightarrow \quad 5\begin{bmatrix} 9 & 1 \\ 7 & 8 \end{bmatrix} + 3\begin{bmatrix} 1 & 5 \\ 7 & 12 \end{bmatrix} + 2\begin{bmatrix} x & y \\ z & w \end{bmatrix} = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$$

$$\Rightarrow \quad \begin{bmatrix} 45 & 5 \\ 35 & 40 \end{bmatrix} + \begin{bmatrix} 3 & 15 \\ 21 & 36 \end{bmatrix} + \begin{bmatrix} 2x & 2y \\ 2z & 2w \end{bmatrix} = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$$

$$\Rightarrow \quad \begin{bmatrix} 45+3+2x & 5+15+2y \\ 35+21+2z & 40+36+2w \end{bmatrix} = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$$

$$\Rightarrow \quad \begin{bmatrix} 48+2x & 20+2y \\ 56+2z & 76+2w \end{bmatrix} = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$$

Since, corresponding entries of equal matrices are equal.

$48 + 2x = 0$

$x = -\frac{48}{2}$

$x = -24$

$20 + 2y = 0$

$y = -\frac{20}{2}$

$y = -10$

$56 + 2z = 0$

$z = -\frac{56}{2}$

$z = -28$

$76 + 2w = 0$

$w = -\frac{76}{2}$

$w = -38$

Hence, $C = \begin{bmatrix} -24 & -10 \\ -28 & -38 \end{bmatrix}$

Algebra of Matrices Ex 5.2 Q13

Given,

$$A = \begin{bmatrix} 2 & -2 \\ 4 & 2 \\ -5 & 1 \end{bmatrix}, B = \begin{bmatrix} 8 & 0 \\ 4 & -2 \\ 3 & 6 \end{bmatrix}$$

And

$$2A + 3X = 5B$$

$$\Rightarrow \quad 3X = 5B - 2A$$

$$\Rightarrow \quad 3X = 5\begin{bmatrix} 8 & 0 \\ 4 & -2 \\ 3 & 6 \end{bmatrix} - 2\begin{bmatrix} 2 & -2 \\ 4 & 2 \\ -5 & 1 \end{bmatrix}$$

$$\Rightarrow \quad 3X = \begin{bmatrix} 40 & 0 \\ 20 & -10 \\ 15 & 30 \end{bmatrix} - \begin{bmatrix} 4 & -4 \\ 8 & 4 \\ -10 & 2 \end{bmatrix}$$

$$\Rightarrow \quad 3X = \begin{bmatrix} 40-4 & 0+4 \\ 20-8 & -10-4 \\ 15+10 & 30-2 \end{bmatrix}$$

$$\Rightarrow \quad 3X = \begin{bmatrix} 36 & 4 \\ 12 & -14 \\ 25 & 28 \end{bmatrix}$$

$$\Rightarrow \quad X = \begin{bmatrix} \frac{36}{3} & \frac{4}{3} \\ \frac{12}{3} & \frac{-14}{3} \\ \frac{25}{3} & \frac{28}{3} \end{bmatrix}$$

$$\Rightarrow \quad X = \begin{bmatrix} 12 & \frac{4}{3} \\ 4 & \frac{-14}{3} \\ \frac{25}{3} & \frac{28}{3} \end{bmatrix}$$

Hence,

$$\begin{bmatrix} & \frac{4}{3} \end{bmatrix}$$

$$X = \begin{bmatrix} 12 & \\ 4 & \frac{-14}{3} \\ \frac{25}{3} & \frac{28}{3} \end{bmatrix}$$

Algebra of Matrices Ex 5.2 Q14

Given,

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

And

$$A + B + C = 0$$

$$\Rightarrow \quad C = -A - B + 0$$

$$\Rightarrow \quad C = -A - B$$

$$\Rightarrow \quad C = -\begin{bmatrix} 1 & -3 & 2 \\ 2 & 0 & 2 \end{bmatrix} - \begin{bmatrix} 2 & -1 & -1 \\ 1 & 0 & -1 \end{bmatrix}$$

$$\Rightarrow \quad C = \begin{bmatrix} -1 & 3 & -2 \\ -2 & 0 & -2 \end{bmatrix} - \begin{bmatrix} 2 & -1 & -1 \\ 1 & 0 & -1 \end{bmatrix}$$

$$\Rightarrow \quad C = \begin{bmatrix} -1-2 & 3+1 & -2+1 \\ -2-1 & 0-0 & -2+1 \end{bmatrix}$$

$$\Rightarrow \quad C = \begin{bmatrix} -3 & 4 & -1 \\ -3 & 0 & -1 \end{bmatrix}$$

Hence,

$$C = \begin{bmatrix} -3 & 4 & -1 \\ -3 & 0 & -1 \end{bmatrix}$$

Algebra of Matrices Ex 5.2 Q15(i)

$$\begin{bmatrix} x-y & 2 & -2 \\ 4 & x & 6 \end{bmatrix}+\begin{bmatrix} 3 & -2 & 2 \\ 1 & 0 & -1 \end{bmatrix}=\begin{bmatrix} 6 & 0 & 0 \\ 5 & 2x+y & 5 \end{bmatrix}$$

$$\begin{bmatrix} x-y+3 & 2-2 & -2+2 \\ 4+1 & x+0 & 6-1 \end{bmatrix}=\begin{bmatrix} 6 & 0 & 0 \\ 5 & 2x+y & 5 \end{bmatrix}$$

$$\begin{bmatrix} x-y+3 & 0 & 0 \\ 5 & x & 5 \end{bmatrix}=\begin{bmatrix} 6 & 0 & 0 \\ 5 & 2x+y & 5 \end{bmatrix}$$

Use know that, corresponding entries of equal matrices are equal. So,

$x-y+3=6$

$\Rightarrow \quad x-y=3 \qquad$ ---(i)

and $\quad x=2x+y$

$\Rightarrow \quad 2x-x+y=0$

$\Rightarrow \quad x+y=0 \qquad$ ---(ii)

Adding equation (i), (ii),

$x-y+x+y=3+0$

$\Rightarrow \quad 2x=3$

$\Rightarrow \quad x=\frac{3}{2}$

Put in equation (i),

$x-y=3$

$\Rightarrow \quad \frac{3}{2}-y=3$

$\Rightarrow \quad -y=\frac{3-3}{2}$

$\Rightarrow \quad y=\frac{-3}{2}$

Hence,

$x=\frac{3}{2}, y=\frac{-3}{2}$

Algebra of Matrices Ex 5.2 Q15(ii)

$[x \quad y+2 \quad z-3]+[y \quad 4 \quad 5]=[4 \quad 9 \quad 12]$

$\Rightarrow \quad [x+y \quad y+2+4 \quad z-3+5]=[4 \quad 9 \quad 12]$

$\Rightarrow \quad [x+y \quad y+6 \quad z+2]=[4 \quad 9 \quad 12]$

We know that, corresponding entries, of equal matrices are equal, So

$x+y=4 \qquad$ ---(i)

$y+6=9 \qquad$ ---(ii)

$z+2=12 \qquad$ ---(iii)

From equation (ii), We get

$y=9-6$

$y=3$

Put the value of y in equation (i),

$x+y=4$

$\Rightarrow \quad x+3=4$

$\Rightarrow \quad x=4-3$

$\Rightarrow \quad x=1$

From equation (iii)

$z=2=12$

$z=12-2$

$z=10$

Hence,

$x=1, y=3, z=10$

********** END **********