



Algebra of Matrices Ex 5.3 Q39

Given,

$$\begin{bmatrix} 2 & 0 & 7 \\ 0 & 1 & 0 \\ 1 & -2 & 1 \end{bmatrix} \begin{bmatrix} -x & 14x & 7x \\ 0 & 1 & 0 \\ x & -4x & -2x \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} -2x + 0 + 7x & 28x + 0 - 28x & 14x + 0 - 14x \\ 0 + 0 + 0 & 0 + 1 + 0 & 0 + 0 + 0 \\ -x + 0 + x & 14x - 2 - 4x & 7x + 0 - 2x \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} 5x & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 10x - 2 & 5x \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

Since, corresponding entries of equal matrices are equal, so

$$5x = 1 \quad \text{and} \quad 10x - 2 = 0$$

$$\Rightarrow x = \frac{1}{5} \quad \text{and} \quad x = \frac{1}{5}$$

$$\text{Hence, } x = \frac{1}{5}$$

Algebra of Matrices Ex 5.3 Q40(i)

Here,

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

$$\Rightarrow \begin{bmatrix} x - 2 & 0 - 3 \end{bmatrix} \begin{bmatrix} x \\ 5 \end{bmatrix} = 0$$

$$\Rightarrow [(x - 2)x - 15] = 0$$

$$\Rightarrow x^2 - 2x - 15 = 0$$

$$\Rightarrow x^2 - 5x + 3x - 15 = 0$$

$$\Rightarrow x(x - 5) + 3(x - 5) = 0$$

$$\Rightarrow (x - 5)(x + 3) = 0$$

$$\Rightarrow x - 5 = 0 \quad \text{or} \quad x + 3 = 0$$

$$\Rightarrow x = 5 \quad \text{or} \quad x = -3$$

So,

$$x = 5 \text{ or } -3$$

Algebra of Matrices Ex 5.3 Q40(ii)

We have:

$$\begin{aligned}
 & \begin{bmatrix} x & -5 & -1 \end{bmatrix} \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix} \begin{bmatrix} x \\ 4 \\ 1 \end{bmatrix} = O \\
 & \Rightarrow \begin{bmatrix} x+0-2 & 0-10+0 & 2x-5-3 \end{bmatrix} \begin{bmatrix} x \\ 4 \\ 1 \end{bmatrix} = O \\
 & \Rightarrow \begin{bmatrix} x-2 & -10 & 2x-8 \end{bmatrix} \begin{bmatrix} x \\ 4 \\ 1 \end{bmatrix} = O \\
 & \Rightarrow [x(x-2)-40+2x-8] = O \\
 & \Rightarrow [x^2-2x-40+2x-8] = [0] \\
 & \Rightarrow [x^2-48] = [0] \\
 & \therefore x^2-48=0 \\
 & \Rightarrow x^2=48 \\
 & \Rightarrow x=\pm 4\sqrt{3}
 \end{aligned}$$

Algebra of Matrices Ex 5.3 Q41

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

$$\begin{aligned}
 & A^2 - 4A + 3I_3 \\
 & = \begin{bmatrix} 1 & 2 & 0 \\ 3 & -4 & 5 \\ 0 & -1 & 3 \end{bmatrix} \begin{bmatrix} 1 & 2 & 0 \\ 3 & -4 & 5 \\ 0 & -1 & 3 \end{bmatrix} - 4 \begin{bmatrix} 1 & 2 & 0 \\ 3 & -4 & 5 \\ 0 & -1 & 3 \end{bmatrix} + 3 \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \\
 & = \begin{bmatrix} 1+6+0 & 2-8+0 & 0+10+0 \\ 3-12+0 & 6+16-5 & 0-20+15 \\ 0-3+0 & 0+4-3 & 0-5+9 \end{bmatrix} - \begin{bmatrix} 4 & 8 & 0 \\ 12 & -16 & 20 \\ 0 & -4 & 12 \end{bmatrix} + \begin{bmatrix} 3 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 3 \end{bmatrix} \\
 & = \begin{bmatrix} 7 & -6 & 10 \\ -9 & 17 & -5 \\ -3 & 1 & 4 \end{bmatrix} - \begin{bmatrix} 4 & 8 & 0 \\ 12 & -16 & 20 \\ 0 & -4 & 12 \end{bmatrix} + \begin{bmatrix} 3 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 3 \end{bmatrix} \\
 & = \begin{bmatrix} 7-4+3 & -6-8+0 & 10-0+0 \\ -9-12+0 & 17+16+3 & -5-20+0 \\ -3-0+0 & 1+4+0 & 4-12+3 \end{bmatrix} \\
 & = \begin{bmatrix} 6 & -14 & 10 \\ -21 & 36 & -25 \\ -3 & 5 & -5 \end{bmatrix}
 \end{aligned}$$

Hence,

$$A^2 - 4A + 3I_3 = \begin{bmatrix} 6 & -14 & 10 \\ -21 & 36 & -25 \\ -3 & 5 & -5 \end{bmatrix}$$

***** END *****