

Assignment 1

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Question 7(c) \Rightarrow Given $\begin{pmatrix} 4 & 2 \\ -1 & 1 \end{pmatrix} M = 6I$, where M is a matrix and I is unit matrix of order 2×2 .

(i) State the order of matrix M

(ii) Find the matrix M

solution (i)

$$\Rightarrow \begin{pmatrix} 4 & 2 \\ -1 & 1 \end{pmatrix} M = 6I \quad (1)$$

here I is unit matrix.

we have to find order of matrix M

let the order the matrix M is

$$\Rightarrow a \times b$$

we know that for multiply two matrix their order must be in the form of (x,y) (y,z) here $x, y, z \in N$ hence order of matrix will be $2 \times b$.

so overall left hand side order is

$$\Rightarrow (2 \times 2) \times (2 \times b) = (2 \times b)$$

for comparing LHS=RHS their order must be same so

order of LHS= $(2 \times b)$, RHS= (2×2) hence b = 2.

hence the order of matrix M is (2×2) .

solution (ii)

$$A = \begin{pmatrix} 4 & 2 \\ -1 & 1 \end{pmatrix} \quad (2)$$

$$AM = 6I \quad (3)$$

$$\text{multiply by } A^{-1} \quad (4)$$

$$M = A^{-1} \times 6I \quad \therefore I \times M = M \quad (5)$$

as we know that $M \times I = I \times A^{-1}$

$$\begin{pmatrix} 4 & 2 & | & 1 & 0 \\ -1 & 1 & | & 0 & 1 \end{pmatrix} \quad (6)$$

$$R_2 \rightarrow 4R_2 + R_1 \quad \begin{pmatrix} 4 & 2 & | & 1 & 0 \\ 0 & 6 & | & 1 & 4 \end{pmatrix} \quad (7)$$

$$R_1 \rightarrow 3R_1 - R_2 \quad \begin{pmatrix} 12 & 0 & | & 2 & -4 \\ 0 & 6 & | & 1 & 4 \end{pmatrix} \quad (8)$$

$$R_1 \rightarrow \frac{R_1}{2} \quad \begin{pmatrix} 6 & 0 & | & 1 & -2 \\ 0 & 6 & | & 1 & 4 \end{pmatrix} \quad (9)$$

$$\begin{pmatrix} 1 & 0 & | & \frac{1}{6} & \frac{-2}{6} \\ 0 & 1 & | & \frac{1}{6} & \frac{4}{6} \end{pmatrix} \quad (10)$$

by calculation we get

$$A^{-1} = \begin{pmatrix} \frac{1}{6} & \frac{-1}{3} \\ \frac{1}{6} & \frac{2}{3} \end{pmatrix} \quad (11)$$

$$6I = \begin{pmatrix} 6 & 0 \\ 0 & 6 \end{pmatrix} \quad (12)$$

by calculation we get

$$M = \begin{pmatrix} 1 & -2 \\ 1 & 4 \end{pmatrix} \quad (13)$$