



Adjoint and Inverse of Matrix Ex 7.1 Q11

$$A = \begin{bmatrix} 3 & 2 \\ 7 & 5 \end{bmatrix} \quad \therefore |A| = 1 \neq 0 \text{ and } \text{adj } A = \begin{bmatrix} 5 & -2 \\ -7 & 3 \end{bmatrix}$$

$$\therefore A^{-1} = \frac{\text{adj } A}{|A|} = \frac{1}{1} \begin{bmatrix} 5 & -2 \\ -7 & 3 \end{bmatrix}$$

$$B = \begin{bmatrix} 6 & 7 \\ 7 & 9 \end{bmatrix} \quad \therefore |B| = -2 \neq 0 \text{ and } \text{adj } B = \begin{bmatrix} 9 & -7 \\ -8 & 6 \end{bmatrix}$$

$$\therefore B^{-1} = \frac{\text{adj } B}{|B|} = \frac{1}{(-2)} \begin{bmatrix} 9 & -7 \\ -8 & 6 \end{bmatrix}$$

$$\text{Now, } (AB)^{-1} = B^{-1} \cdot A^{-1}$$

$$(AB)^{-1} = \frac{1}{(-2)} \begin{bmatrix} 9 & -7 \\ -8 & 6 \end{bmatrix} \begin{bmatrix} 5 & -2 \\ -7 & 3 \end{bmatrix}$$

$$(AB)^{-1} = -\frac{1}{2} \begin{bmatrix} 94 & -39 \\ -82 & 34 \end{bmatrix}$$

$$(AB)^{-1} = \begin{bmatrix} -47 & \frac{39}{2} \\ 41 & -17 \end{bmatrix}$$

Adjoint and Inverse of Matrix Ex 7.1 Q12

$$A = \begin{bmatrix} 2 & -3 \\ -4 & 7 \end{bmatrix} \quad \therefore |A| = 2 \neq 0$$

$$\text{adj } A = \begin{bmatrix} 7 & 3 \\ 4 & 2 \end{bmatrix}$$

$$\therefore A^{-1} = \frac{1}{2} \begin{bmatrix} 7 & 3 \\ 4 & 2 \end{bmatrix}$$

$$\text{To show:} \quad 2A^{-1} = 9I - A$$

$$\text{LHS:} \quad 2A^{-1} = 2 \cdot \frac{1}{2} \begin{bmatrix} 7 & 3 \\ 4 & 2 \end{bmatrix} = \begin{bmatrix} 7 & 3 \\ 4 & 2 \end{bmatrix}$$

$$\text{RHS:} \quad 9I - A = \begin{bmatrix} 9 & 0 \\ 0 & 9 \end{bmatrix} - \begin{bmatrix} 2 & -3 \\ -4 & 7 \end{bmatrix} = \begin{bmatrix} 7 & 3 \\ 4 & 2 \end{bmatrix}$$

$$\text{Therefore,} \quad 2A^{-1} = 9I - A$$

Adjoint and Inverse of Matrix Ex 7.1 Q13

$$A = \begin{bmatrix} 4 & 5 \\ 2 & 1 \end{bmatrix} \quad \therefore |A| = -6 \text{ and } \text{adj } A = \begin{bmatrix} 1 & -5 \\ -2 & 4 \end{bmatrix} \quad \therefore A^{-1} = \frac{1}{-6} \begin{bmatrix} 1 & -5 \\ -2 & 4 \end{bmatrix}$$

$$\text{To show:} \quad A - 3I = 2(I + 3A^{-1})$$

$$\therefore \text{LHS} = A - 3I = \begin{bmatrix} 4 & 5 \\ 2 & 1 \end{bmatrix} - \begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix} = \begin{bmatrix} 1 & 5 \\ 2 & -2 \end{bmatrix}$$

$$\begin{aligned} \text{RHS:} \quad 2(I + 3A^{-1}) &= 2I + 2 \cdot 3 \cdot A^{-1} = \begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix} + 2 \cdot 3 \cdot \frac{1}{-6} \begin{bmatrix} -1 & 5 \\ 2 & -4 \end{bmatrix} \\ &= \begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix} + \begin{bmatrix} -1 & 5 \\ 2 & -4 \end{bmatrix} \\ &= \begin{bmatrix} 1 & 5 \\ 2 & -2 \end{bmatrix} \end{aligned}$$

$$\therefore \quad A - 3I = 2(I + 3A^{-1})$$

Adjoint and Inverse of Matrix Ex 7.1 Q14

$$A = \begin{bmatrix} a & b \\ c & \frac{1+bc}{a} \end{bmatrix}$$

$$\Rightarrow |A| = (1+bc) - bc = 1 \neq 0$$

$$A^{-1} = \frac{1}{|A|} \cdot \text{adj} A = \frac{1}{1} \begin{bmatrix} \frac{1+bc}{a} & -b \\ -c & a \end{bmatrix}$$

$$\text{Now } aA^{-1} = (a^2 + bc + 1)I - aA$$

$$LHS : aA^{-1} = a \begin{bmatrix} \frac{1+bc}{a} & -b \\ -c & a \end{bmatrix} = \begin{bmatrix} 1+bc & -ab \\ -ac & a^2 \end{bmatrix}$$

$$RHS : (a^2 + bc + 1)I - aA = \begin{bmatrix} a^2 + bc + 1 & 0 \\ 0 & a^2 + bc + 1 \end{bmatrix} - \begin{bmatrix} a^2 & ab \\ ac & 1+bc \end{bmatrix} = \begin{bmatrix} 1+bc & -ab \\ -ac & a^2 \end{bmatrix}$$

Since,  $LHS = RHS$

Hence, proved

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