



### Adjoint and Inverse of Matrix Ex 7.1 Q3

Here

$$A = \begin{bmatrix} 1 & -1 & 1 \\ 2 & 3 & 0 \\ 18 & 2 & 10 \end{bmatrix}$$

Cofactors of  $A$  are

$$C_{11} = 30 \quad C_{12} = 12 \quad C_{13} = -3$$

$$C_{21} = -20 \quad C_{22} = -8 \quad C_{23} = 2$$

$$C_{31} = -50 \quad C_{32} = -20 \quad C_{33} = 5$$

Therefore,

$$\begin{aligned} \text{adj } A &= \begin{bmatrix} C_{11} & C_{12} & C_{13} \\ C_{21} & C_{22} & C_{23} \\ C_{31} & C_{32} & C_{33} \end{bmatrix}^T \\ &= \begin{bmatrix} 30 & -20 & -50 \\ 12 & -8 & -20 \\ -3 & 2 & 5 \end{bmatrix}^T \end{aligned}$$

So,

$$\text{adj } A = \begin{bmatrix} 30 & 12 & -3 \\ -20 & -8 & 2 \\ -50 & -20 & 5 \end{bmatrix}$$

Now,

$$\begin{aligned} A(\text{adj } A) &= \begin{bmatrix} 1 & -1 & 1 \\ 2 & 3 & 0 \\ 18 & 2 & 10 \end{bmatrix} \begin{bmatrix} 30 & 12 & -3 \\ -20 & -8 & 2 \\ -50 & -20 & 5 \end{bmatrix} \\ &= \begin{bmatrix} 1 & -1 & 1 \\ 2 & 3 & 0 \\ 18 & 2 & 10 \end{bmatrix} \begin{pmatrix} 0 \end{pmatrix} \\ &= 0 \end{aligned}$$

Hence proved.

### Adjoint and Inverse of Matrix Ex 7.1 Q4

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

Cofactors of  $A$  are:

$$\begin{array}{lll} C_{11} = -4 & C_{21} = -3 & C_{31} = -3 \\ C_{12} = 1 & C_{22} = 0 & C_{32} = 1 \\ C_{13} = 4 & C_{23} = 4 & C_{33} = 3 \end{array}$$

$$\begin{aligned} \therefore \text{adj}A &= \begin{bmatrix} C_{11} & C_{12} & C_{13} \\ C_{21} & C_{22} & C_{23} \\ C_{31} & C_{32} & C_{33} \end{bmatrix}^T \\ &= \begin{bmatrix} -4 & 1 & 4 \\ -3 & 0 & 4 \\ -3 & 1 & 3 \end{bmatrix}^T \end{aligned}$$

Therefore,  $\text{adj}A = \begin{bmatrix} -4 & -3 & -3 \\ 1 & 0 & 1 \\ 4 & 4 & 3 \end{bmatrix}$

So,  $\text{adj}A = A$

Adjoint and Inverse of Matrix Ex 7.1 Q5

Here  $A = \begin{bmatrix} -1 & -2 & -2 \\ 2 & 1 & -2 \\ 2 & -2 & 1 \end{bmatrix}$

Cofactors of  $A$  are:

$$\begin{array}{lll} C_{11} = -3 & C_{21} = 6 & C_{31} = 6 \\ C_{12} = -6 & C_{22} = 3 & C_{32} = -6 \\ C_{13} = -6 & C_{23} = -6 & C_{33} = 3 \end{array}$$

$$\begin{aligned} \therefore \text{adj}A &= \begin{bmatrix} C_{11} & C_{12} & C_{13} \\ C_{21} & C_{22} & C_{23} \\ C_{31} & C_{32} & C_{33} \end{bmatrix}^T \\ &= \begin{bmatrix} -3 & -6 & -6 \\ 6 & 3 & -6 \\ 6 & -6 & 3 \end{bmatrix}^T \end{aligned}$$

Therefore,  $\text{adj}A = \begin{bmatrix} -3 & 6 & 6 \\ -6 & 3 & -6 \\ -6 & -6 & 3 \end{bmatrix}$  --- (i)

Now,  $3.A^T = 3 \begin{bmatrix} -1 & 2 & 2 \\ -2 & 1 & -2 \\ -2 & -2 & 1 \end{bmatrix} = \begin{bmatrix} -3 & 6 & 6 \\ -6 & 3 & -6 \\ -6 & -6 & 3 \end{bmatrix}$  --- (ii)

$\therefore \text{adj}A = 3.A^T$

Adjoint and Inverse of Matrix Ex 7.1 Q6

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

Cofactors of  $A$  are:

$$\begin{array}{lll} C_{11} = 9 & C_{21} = 19 & C_{31} = -4 \\ C_{12} = 4 & C_{22} = 14 & C_{32} = 1 \\ C_{13} = 8 & C_{23} = 3 & C_{33} = 2 \end{array}$$

$$\begin{aligned} \therefore \text{adj}A &= \begin{bmatrix} C_{11} & C_{12} & C_{13} \\ C_{21} & C_{22} & C_{23} \\ C_{31} & C_{32} & C_{33} \end{bmatrix}^T \\ &= \begin{bmatrix} 9 & 4 & 8 \\ 19 & 14 & 3 \\ -4 & 1 & 2 \end{bmatrix}^T \end{aligned}$$

Therefore,

$$\text{adj}A = \begin{bmatrix} 9 & 19 & -4 \\ 4 & 14 & 1 \\ 8 & 3 & 2 \end{bmatrix}$$

$$\begin{aligned} \text{Now, } A \text{adj}A &= \begin{bmatrix} 1 & -2 & 3 \\ 0 & 2 & -1 \\ -4 & 5 & 2 \end{bmatrix} \begin{bmatrix} 9 & 19 & -4 \\ 4 & 14 & 1 \\ 8 & 3 & 2 \end{bmatrix} \\ &= \begin{bmatrix} 25 & 0 & 0 \\ 0 & 25 & 0 \\ 0 & 0 & 25 \end{bmatrix} \\ &= 25 \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \\ &= 25I_3 \end{aligned}$$

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