

$$|A| = (a_{11} \cdot a_{22} \cdot a_{33} + a_{12} \cdot a_{23} \cdot a_{31} + a_{13} \cdot a_{21} \cdot a_{32}) - (a_{31} \cdot a_{22} \cdot a_{13} + a_{32} \cdot a_{23} \cdot a_{11} + a_{33} \cdot a_{21} \cdot a_{12})$$

For Example:- Find the determinant for the following matrix

$$B = \begin{bmatrix} 2 & 0 & 1 \\ 3 & 4 & 1 \\ 1 & 2 & 5 \end{bmatrix}$$

Sol:-

$$|B| = \begin{vmatrix} 2 & 0 & 1 \\ 3 & 4 & 1 \\ 1 & 2 & 5 \end{vmatrix} \begin{vmatrix} 2 & 0 \\ 3 & 4 \\ 1 & 2 \end{vmatrix}$$

$$= [(2 \times 4 \times 5) + (0 \times 1 \times 1) + (1 \times 3 \times 2)] - [(1 \times 4 \times 1) + (2 \times 1 \times 2) + (5 \times 3 \times 0)]$$

$$= (40 + 0 + 6) - (4 + 4 + 0)$$

$$= 46 - 8 = 38$$

Eg ② Find $|B|$ with using shortcut method

$$B = \begin{bmatrix} -5 & 2 & -2 \\ 3 & 0 & 1 \\ 10 & -1 & 2 \end{bmatrix}$$

Solve

$$|B| = \begin{vmatrix} -5 & 2 & -2 \\ 3 & 0 & 1 \\ 10 & -1 & 2 \end{vmatrix} \begin{vmatrix} -5 & 2 \\ 3 & 0 \\ 10 & -1 \end{vmatrix}$$

$$= [0 + 20 + 20] - [0 + 25 + 10]$$

$$= 40 - 35 = 5$$

مثال

E.g. Find the determinant of $\begin{vmatrix} 2 & 4 & 5 \\ -3 & 2 & -1 \\ -2 & -3 & 4 \end{vmatrix}$

Sol:

$$\begin{vmatrix} 2 & 4 & 5 \\ -3 & 2 & -1 \\ -2 & -3 & 4 \end{vmatrix} = \begin{vmatrix} 2 & 4 \\ -3 & 2 \\ -2 & -3 \end{vmatrix}$$

$$= [16 + 8 + 45] - [-20 + 6 - 48]$$

$$= 69 - (-62) = 131$$