

Determinants - Class XII

Past Year JEE Questions

Questions

Question: 01

$$\text{If } \Delta = \begin{vmatrix} x-2 & 2x-3 & 3x-4 \\ 2x-3 & 3x-4 & 4x-5 \\ 3x-5 & 5x-8 & 10x-17 \end{vmatrix} =$$

$Ax^3 + Bx^2 + Cx + D$, then $B + C$ is equal to :

- A. -1
- B. -3
- C. 9
- D. 1

Solutions

Solution: 01

Explanation

$$\Delta = \begin{vmatrix} x-2 & 2x-3 & 3x-4 \\ 2x-3 & 3x-4 & 4x-5 \\ 3x-5 & 5x-8 & 10x-17 \end{vmatrix}$$

$$R_2 \rightarrow R_2 - R_1$$

$$R_3 \rightarrow R_3 - R_2$$

$$= \begin{vmatrix} x-2 & 2x-3 & 3x-4 \\ x-1 & x-1 & x-1 \\ x-2 & 2(x-2) & 6(x-2) \end{vmatrix}$$

$$= (x-1)(x-2) \begin{vmatrix} x-2 & 2x-3 & 3x-4 \\ 1 & 1 & 1 \\ 1 & 2 & 6 \end{vmatrix}$$

$$C_1 \rightarrow C_1 - C_2$$

$$C_2 \rightarrow C_2 - C_3$$

$$= (x-1)(x-2) \begin{vmatrix} -x+1 & -x+1 & 3x-4 \\ 0 & 0 & 1 \\ -1 & -4 & 6 \end{vmatrix}$$

$$= -(x-1)(x-2)[-4(1-x) + 1(1-x)]$$

$$= -(x^2 - 3x + 2)[3x - 3]$$

$$= -3x^3 + 9x^2 - 6x + 3x^2 - 9x + 6$$

$$= -3x^3 + 12x^2 - 15x + 6 = Ax^3 + Bx^2 + Cx + D$$

$$\therefore A = -3, B = 12, C = -15$$

$$\therefore B + C = 12 - 15 = -3$$