10.02.25

Chio's method :

1) Evaluate the determinant by chio's method.

$$\begin{vmatrix} 1 & 1 & 1 & 1 \\ 1 & 2 & 1 & 1 \\ 1 & 1 & 4 & 6 \\ 1 & 1 & 5 & 8 \end{vmatrix}$$

2) $$\begin{vmatrix} 1 & 1 & 1 & 1 \\ 1 & 2 & 1 & 1 \\ 1 & 1 & 4 & 6 \\ 1 & 1 & 5 & 8 \end{vmatrix}$$

$$= \frac{1}{(1)^{4-2}} \begin{vmatrix} \begin{vmatrix} 1 & 1 \\ 1 & 2 \end{vmatrix} & \begin{vmatrix} 1 & 1 \\ 1 & 1 \end{vmatrix} & \begin{vmatrix} 1 & 1 \\ 1 & 1 \end{vmatrix} \\ \begin{vmatrix} 1 & 1 \\ 1 & 1 \end{vmatrix} & \begin{vmatrix} 1 & 1 \\ 1 & 4 \end{vmatrix} & \begin{vmatrix} 1 & 1 \\ 1 & 6 \end{vmatrix} \\ \begin{vmatrix} 1 & 1 \\ 1 & 1 \end{vmatrix} & \begin{vmatrix} 1 & 1 \\ 1 & 5 \end{vmatrix} & \begin{vmatrix} 1 & 1 \\ 1 & 8 \end{vmatrix} \end{vmatrix}$$

$$= \begin{vmatrix} 1 & 0 & 0 \\ 0 & 3 & 5 \\ 0 & 4 & 7 \end{vmatrix}$$

$$= \frac{1}{(1)^{3-2}} \begin{vmatrix} \begin{vmatrix} 1 & 0 \\ 0 & 3 \end{vmatrix} & \begin{vmatrix} 1 & 0 \\ 0 & 5 \end{vmatrix} \\ \begin{vmatrix} 1 & 0 \\ 0 & 4 \end{vmatrix} & \begin{vmatrix} 1 & 0 \\ 0 & 7 \end{vmatrix} \end{vmatrix}$$

$$= \begin{vmatrix} 3 & 5 \\ 4 & 7 \end{vmatrix}$$

$= 21 - 20$

$= 1$ Ans.

2) Evaluate by using Chio's method of the determinant

$$\begin{vmatrix} 1 & 0 & -1 & 2 \\ 2 & 3 & 2 & -2 \\ 2 & 4 & 2 & 1 \\ 3 & 1 & 5 & -3 \end{vmatrix}$$

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

$$= \frac{1}{(1)^{4-2}} \begin{vmatrix} \begin{vmatrix} 1 & 0 \\ 2 & 3 \end{vmatrix} & \begin{vmatrix} 1 & -1 \\ 2 & 2 \end{vmatrix} & \begin{vmatrix} 1 & 2 \\ 2 & -2 \end{vmatrix} \\ \begin{vmatrix} 1 & 0 \\ 2 & 4 \end{vmatrix} & \begin{vmatrix} 1 & -1 \\ 2 & 2 \end{vmatrix} & \begin{vmatrix} 1 & 2 \\ 2 & 1 \end{vmatrix} \\ \begin{vmatrix} 1 & 0 \\ 3 & 1 \end{vmatrix} & \begin{vmatrix} 1 & -1 \\ 3 & 5 \end{vmatrix} & \begin{vmatrix} 1 & 2 \\ 3 & -3 \end{vmatrix} \end{vmatrix}$$

$$= \begin{vmatrix} 3 & 4 & -6 \\ 4 & 4 & -3 \\ 1 & 8 & -9 \end{vmatrix}$$

$$= \frac{1}{(3)^{3-2}} \begin{vmatrix} \begin{vmatrix} 3 & 4 \\ 4 & 4 \end{vmatrix} & \begin{vmatrix} 3 & -6 \\ 4 & -3 \end{vmatrix} \\ \begin{vmatrix} 3 & 4 \\ 1 & 8 \end{vmatrix} & \begin{vmatrix} 3 & -6 \\ 2 & -11 \end{vmatrix} \end{vmatrix}$$

$$= \frac{1}{3} \begin{vmatrix} -4 & 15 \\ 20 & -21 \end{vmatrix}$$

$$= \frac{1}{3}(84-300)$$

$$= \frac{1}{\cancel{3}} \times -\cancel{216}^{72}$$

$$= -72 \text{ Ans}$$

3) Find the value of the determinant by using Chio's method. $\begin{vmatrix} 1 & 0 & -2 & 2 \\ 2 & 3 & 2 & -2 \\ 2 & 4 & 5 & 1 \\ 3 & 1 & 5 & -1 \end{vmatrix}$

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

$$= \frac{1}{(1)^{4-2}} \begin{vmatrix} \begin{vmatrix} 1 & 0 \\ 2 & 3 \end{vmatrix} & \begin{vmatrix} 1 & -2 \\ 2 & 2 \end{vmatrix} & \begin{vmatrix} 1 & 2 \\ 2 & -2 \end{vmatrix} \\ \begin{vmatrix} 1 & 0 \\ 2 & 4 \end{vmatrix} & \begin{vmatrix} 1 & -2 \\ 2 & 5 \end{vmatrix} & \begin{vmatrix} 1 & 2 \\ 2 & 1 \end{vmatrix} \\ \begin{vmatrix} 1 & 0 \\ 3 & 1 \end{vmatrix} & \begin{vmatrix} 1 & -2 \\ 3 & 5 \end{vmatrix} & \begin{vmatrix} 1 & 2 \\ 3 & -1 \end{vmatrix} \end{vmatrix}$$

$$= \begin{vmatrix} 3 & 6 & -6 \\ 4 & 9 & -3 \\ 1 & 11 & -7 \end{vmatrix}$$

$$= \frac{1}{3^{(3-2)}} \begin{vmatrix} \begin{vmatrix} 3 & 6 \\ 4 & 9 \end{vmatrix} & \begin{vmatrix} 3 & -6 \\ 4 & -3 \end{vmatrix} \\ \begin{vmatrix} 3 & 6 \\ 1 & 11 \end{vmatrix} & \begin{vmatrix} 3 & -6 \\ 1 & -7 \end{vmatrix} \end{vmatrix}$$

$$= \frac{1}{3} \begin{vmatrix} 3 & 15 \\ 27 & -15 \end{vmatrix}$$

$$= \frac{1}{3}\left(-45-(405)\right)$$

$$= \frac{1}{3} \times -450$$

$= -150$ Ans

$27-24$

$-9-(-24)$

$-9+24$

$33-6$

$15 \times 3 = 45$

$27 \times 15 = 135 + 27\times = 405$

$405 + 45 = 450$

** Imp.

4) Find the value of the determinant by Chio's method
$$\begin{vmatrix} 0 & 1 & 0 & 1 \\ -1 & 0 & -1 & 3 \\ 0 & 1 & 0 & 2 \\ -1 & -3 & -2 & 0 \end{vmatrix}$$

= Here, $a_{11} = 0$

So, we interchange the 1st & 2nd column of the determinant—

$$= -\begin{vmatrix} 1 & 0 & 0 & 1 \\ 0 & -1 & -1 & 3 \\ 1 & 0 & 0 & 2 \\ -3 & -1 & -2 & 0 \end{vmatrix}$$

$$= -\frac{1}{(1)^{4-2}} \begin{vmatrix} \begin{vmatrix} 1 & 0 \\ 0 & -1 \end{vmatrix} & \begin{vmatrix} 1 & 0 \\ 0 & -1 \end{vmatrix} & \begin{vmatrix} 1 & 1 \\ 0 & 3 \end{vmatrix} \\ \begin{vmatrix} 1 & 0 \\ 1 & 0 \end{vmatrix} & \begin{vmatrix} 1 & 0 \\ 1 & 0 \end{vmatrix} & \begin{vmatrix} 1 & 1 \\ 1 & 2 \end{vmatrix} \\ \begin{vmatrix} 1 & 0 \\ -3 & -1 \end{vmatrix} & \begin{vmatrix} 1 & 0 \\ -3 & -2 \end{vmatrix} & \begin{vmatrix} 1 & 1 \\ -3 & 0 \end{vmatrix} \end{vmatrix}$$

$$= -1 \begin{vmatrix} -1 & -1 & 3 \\ 0 & 0 & 1 \\ -1 & -2 & -3 \end{vmatrix}$$

$$= \cancel{\frac{1}{(-1)^{3-2}} \begin{vmatrix} \begin{vmatrix} -1 & -1 \\ 0 & 0 \end{vmatrix} & \begin{vmatrix} -1 & 3 \\ 0 & 1 \end{vmatrix} \\ \begin{vmatrix} -1 & -1 \\ -1 & -2 \end{vmatrix} & \begin{vmatrix} -1 & 3 \\ -1 & -3 \end{vmatrix} \end{vmatrix}}$$

$$= -\frac{1}{(-1)^{3-2}} \begin{vmatrix} \begin{vmatrix} -1 & -1 \\ 0 & 0 \end{vmatrix} & \begin{vmatrix} -1 & 3 \\ 0 & 1 \end{vmatrix} \\ \begin{vmatrix} -1 & -1 \\ -1 & -2 \end{vmatrix} & \begin{vmatrix} -1 & 3 \\ -1 & -3 \end{vmatrix} \end{vmatrix}$$

$0-(-1)$

$0+1$

$$= \frac{-1}{(-1)^{1}} \begin{vmatrix} 0 & -1 \\ 1 & 6 \end{vmatrix}$$

$= \underline{1}$ Ans.

5) Evaluate Chio's method $\Delta = \begin{vmatrix} 0 & -1 & 2 & 3 \\ 1 & 2 & -1 & 1 \\ 1 & 1 & -2 & 3 \\ 3 & 2 & 1 & 0 \end{vmatrix}$

Here $a_{11} = 0$

So, we interchange the 1st & 2nd column of the determinant.

$$= - \begin{vmatrix} -1 & 0 & 2 & 3 \\ 2 & 1 & -1 & 1 \\ 1 & 1 & 2 & 3 \\ 2 & 3 & 1 & 0 \end{vmatrix}$$

$$= -\frac{1}{(-1)^{4-2}} \begin{vmatrix} \begin{vmatrix} -1 & 0 \\ 2 & 1 \end{vmatrix} & \begin{vmatrix} -1 & 2 \\ 2 & -1 \end{vmatrix} & \begin{vmatrix} -1 & 3 \\ 2 & 1 \end{vmatrix} \\ \begin{vmatrix} -1 & 0 \\ 1 & 1 \end{vmatrix} & \begin{vmatrix} -1 & 2 \\ 1 & 2 \end{vmatrix} & \begin{vmatrix} -1 & 3 \\ 1 & 3 \end{vmatrix} \\ \begin{vmatrix} -1 & 0 \\ 2 & 3 \end{vmatrix} & \begin{vmatrix} -1 & 2 \\ 2 & 1 \end{vmatrix} & \begin{vmatrix} -1 & 3 \\ 2 & 0 \end{vmatrix} \end{vmatrix}$$

$$= -\begin{vmatrix} -1 & -3 & -7 \\ -1 & -4 & -6 \\ -3 & -5 & -6 \end{vmatrix}$$

$$= -\frac{1}{(-1)^{3-2}} \begin{vmatrix} \begin{vmatrix} -1 & -3 \\ -1 & -4 \end{vmatrix} & \begin{vmatrix} -1 & -7 \\ -1 & -6 \end{vmatrix} \\ \begin{vmatrix} -1 & -3 \\ -3 & -5 \end{vmatrix} & \begin{vmatrix} -1 & -7 \\ -3 & -6 \end{vmatrix} \end{vmatrix}$$

$$= \begin{vmatrix} 1 & -1 \\ -4 & -15 \end{vmatrix}$$

$= -15 - 4$

$= -19$ Ans.