

**Question**

Evaluate the following determinants:

$$\begin{vmatrix} 15 & 19 \\ 13 & 16 \end{vmatrix} \quad \begin{vmatrix} 76 & -23 & 53 \\ 103 & 199 & 302 \\ 176 & 177 & 353 \end{vmatrix}.$$

**Answer**

$$\begin{aligned} \begin{vmatrix} 15 & 19 \\ 13 & 16 \end{vmatrix} &= \begin{vmatrix} 2 & 3 \\ 13 & 16 \end{vmatrix} \\ &= \begin{vmatrix} 2 & 3 \\ 1 & -2 \end{vmatrix} \\ &= -7 \end{aligned}$$

$$\begin{aligned} \begin{vmatrix} 76 & -23 & 53 \\ 103 & 199 & 302 \\ 176 & 177 & 353 \end{vmatrix} &= \begin{vmatrix} 76 & -23 & 53 \\ 103 & 199 & 302 \\ 100 & 200 & 300 \end{vmatrix} \\ &= \begin{vmatrix} 76 & -23 & 53 \\ 3 & -1 & 2 \\ 100 & 200 & 300 \end{vmatrix} \\ &= 100 \begin{vmatrix} 76 & -23 & 53 \\ 3 & -1 & 2 \\ 1 & 2 & 3 \end{vmatrix} \\ &= 100 \begin{vmatrix} 1 & 2 & 3 \\ 3 & -1 & 2 \\ 1 & 2 & 3 \end{vmatrix} \\ &= 0 \end{aligned}$$