

Tips and Tricks:**Tip-1**

As much as possible, avoid direct calculation of determinants using lengthy expansions. Be calm and try to use determinants properties to first simplify and then expand. Some

Tip-2

Minors and cofactors are important concept to understand inverse of a matrix in further lectures.

Note: (a) A determinant of order 3 will have 9 minors and each minor will be a determinant of order 2 and a determinant of order 4 will have 16 minors and each minor will be determinant of order 3.

(b) $a_{11}C_{21} + a_{12}C_{22} + a_{13}C_{23} = 0$, i.e. cofactor multiplied to different row/column elements results in zero value.

Tip-3**Row and Column Operations of Determinants**

(a) $R_i \leftrightarrow R_j$ or $C_i \leftrightarrow C_j$, when $i \neq j$; This notation is used when we interchange i^{th} row (or column) and j^{th} row (or column).

(b) $R_i \leftrightarrow C_i$; This converts the row into the corresponding column.

(c) $R_i \rightarrow Rk_i$ or $C_i \rightarrow kC_i$; $k \in R$; This represents multiplication of i^{th} row (or column) by k .

(d) $R_i \rightarrow R_i k + R_j$ or $C_i \rightarrow C_i k + C_j$; ($i \neq j$); This symbol is used to multiply i^{th} row (or column) by k and adding the j^{th} row (or column) to it.

These operations are VERY USEFUL in simplifying complex determinants.