$k\begin{bmatrix} a_1 & b_1 \\ a_2 & b_2 \end{bmatrix} = \begin{bmatrix} ka_1 & kb_1 \\ ka_2 & kb_2 \end{bmatrix}.$

(17) **Multiplicability of two matrices:-**

$Let\ there\ are\ two\ matrices\ [A]_{R_1 \times C_1}$ & $[B]_{R_2 \times C_2}.$

$If\ C_1 = R_2, then\ A \times B\ exists\ otherwise\ not\ and\ the\ order\ of\ the\ resulting\ matrix\ will\ be\ R_1 \times C_2.$

(18) **Multiplication of two matrices:-**

$$\begin{bmatrix} a_1 & b_1 \\ a_2 & b_2 \end{bmatrix} \times \begin{bmatrix} c_1 & d_1 \\ c_2 & d_2 \end{bmatrix} = \begin{bmatrix} a_1c_1 + b_1c_2 & a_1d_1 + b_1d_2 \\ a_2c_1 + b_2c_2 & a_2d_1 + b_2d_2 \end{bmatrix}$$

(19) **Adjoint matrix:-**

$$If\ A = \begin{bmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{bmatrix}, \quad then\ \ Adj.A = \begin{bmatrix} +\begin{vmatrix} b_2 & c_2 \\ b_3 & c_3 \end{vmatrix} & -\begin{vmatrix} b_1 & c_1 \\ b_3 & c_3 \end{vmatrix} & +\begin{vmatrix} b_1 & c_1 \\ b_2 & c_2 \end{vmatrix} \\ -\begin{vmatrix} a_2 & c_2 \\ a_3 & c_3 \end{vmatrix} & +\begin{vmatrix} a_1 & c_1 \\ a_3 & c_3 \end{vmatrix} & -\begin{vmatrix} a_1 & c_1 \\ a_2 & c_2 \end{vmatrix} \\ +\begin{vmatrix} a_2 & b_2 \\ a_3 & b_3 \end{vmatrix} & -\begin{vmatrix} a_1 & b_1 \\ a_3 & b_3 \end{vmatrix} & +\begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix} \end{bmatrix}$$

(20) **Inverse matrix:-** $A^{-1} = \frac{Adj.\ A}{|A|}$ $\qquad [|A| \neq 0]$

(21) $A = \frac{1}{2}(A + A^T) + \frac{1}{2}(A - A^T)$

$where, A = square\ matrix$

$\frac{1}{2}(A + A^T) = symmetric\ matrix$

$\frac{1}{2}(A - A^T) = skew -\ symmetric\ matrix$

(22) **Some useful relations:-**

(i) $(A^T)^T = A$

(ii) $(A \pm B)^T = A^T \pm B^T$

(iii) $(AB)^T = B^T A^T$

(iv) $A^{-1}A = I$

(v) $AA^{-1} = I$

(vi) $(A^{-1})^{-1} = A$

(vii) $(A^{-1})^T = (A^T)^{-1}$

(viii) $(AB)^{-1} = B^{-1}A^{-1}$

(ix) $AB \neq BA\ in\ general$

(x) $(AB)C = A(BC)$

(xi) $A(B + C) = AB + AC$

(xii) $A.O = O.A = O$

(xiii) $AI = IA = A$

(xiv) $If\ A \neq O$ & $B \neq O,\ then\ AB = O\ (it\ may\ be)$

(xv) $If\ CA = CB,\ then\ it\ is\ not\ mandatory\ \ A = B.$

Martin's Rule:-

$Let, a_1x + b_1y + c_1z = k_1$

$a_2x + b_2y + c_2z = k_2$