# Addition and Subtraction of Matrices.

If $A = [a_{ij}]_{m \times n}$ and $B = [b_{ij}]_{m \times n}$ are two matrices of the same order then their sum *A*+*B* is a matrix whose each element is the sum of corresponding elements. *i.e.* $A + B = [a_{ij} + b_{ij}]_{m \times n}$

*Example*: If $A = \begin{bmatrix} 5 & 2 \\ 1 & 3 \\ 4 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 5 \\ 2 & 2 \\ 3 & 3 \end{bmatrix}$, then $A + B = \begin{bmatrix} 5+1 & 2+5 \\ 1+2 & 3+2 \\ 4+3 & 1+3 \end{bmatrix} = \begin{bmatrix} 6 & 7 \\ 3 & 5 \\ 7 & 4 \end{bmatrix}$

Similarly, their subtraction $A - B$ is defined as $A - B = [a_{ij} - b_{ij}]_{m \times n}$

*i.e.* in above example $A - B = \begin{bmatrix} 5-1 & 2-5 \\ 1-2 & 3-2 \\ 4-3 & 1-3 \end{bmatrix} = \begin{bmatrix} 4 & -3 \\ -1 & 1 \\ 1 & -2 \end{bmatrix}$

Note: Matrix addition and subtraction can be possible only when matrices are of the same order.

**Properties of matrix addition:** If *A*, *B* and *C* are matrices of same order, then

(i) $A + B = B + A$ (Commutative law)

(ii) $(A + B) + C = A + (B + C)$ (Associative law)

(iii) $A + O = O + A = A$, Where O is zero matrix which is additive identity of the matrix.

(iv) $A + (-A) = 0 = (-A) + A$, where $(-A)$ is obtained by changing the sign of every element of *A*, which is additive inverse of the matrix.

(v) $\left.\begin{matrix} A + B = A + C \\ B + A = C + A \end{matrix}\right\} \Rightarrow B = C$ (Cancellation law)