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ADDITION AND SUBTRACTION OF MATRICES

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Addition of Matrices

$$\mathbf{A}+\mathbf{B}=\begin{bmatrix} a_{11}+b_{11} & a_{12}+b_{12} & \cdots & a_{1n}+b_{1n} \\ a_{21}+b_{21} & a_{22}+b_{22} & \cdots & a_{2n}+b_{2n} \\ \vdots & \vdots & & \vdots \\ a_{p1}+b_{p1} & a_{p2}+b_{p2} & \cdots & a_{pn}+b_{pn} \end{bmatrix}$$

$$\begin{bmatrix} a_1 & a_2 \\ a_3 & a_4 \end{bmatrix} - \begin{bmatrix} b_1 & b_2 \\ b_3 & b_4 \end{bmatrix} = \begin{bmatrix} a_1-b_1 & a_2-b_2 \\ a_3-b_3 & a_4-b_4 \end{bmatrix}$$

The sum of two matrices is obtained by adding the corresponding elements of both the matrices. While adding two matrices, their order must be the same.
In general, if A = [aij] and B = [bij] are two matrices of same order then the sum of A and B is given by matrix C = [cij] where cij = aij + bij for all possible values of i and j.

For example: If $A=\begin{bmatrix} 1 & -4 & 5 \\ -8 & 2 & 6 \end{bmatrix}$ and $B=\begin{bmatrix} 0 & -2 & 4 \\ 5 & 7 & 0 \end{bmatrix}$ then

$$A + B = \begin{bmatrix} 1+0 & -4+-2 & 5+4 \\ -8+5 & 2+7 & 6+0 \end{bmatrix} = \begin{bmatrix} 1 & -6 & 9 \\ -3 & 9 & 6 \end{bmatrix}$$

Properties of Matrix addition

i) Commutative Law: If A and B are any two matrices of same order then A + B = B + A
ii) Associative Law: If A, B and C are any three matrices of same order then A + (B + C) = (A + B) + C
iii) Existence of additive identity: Let A be a matrix of order m x n and 0 be an m x n zero matrix, then A + 0 = 0 + A.
iv) Existence ofadditive inverse: Let A be any matrix, then we can find another matrix –A such that A + (-A) = 0. So additive inverse of A is –A.

Difference of two matrices

If A and B are two matrices of same order, then the difference A - B is obtained by subtracting the corresponding elements of A and B.

For example: If $A=\begin{bmatrix} 1 & 2 \\ -8 & 3 \\ 9 & 4 \end{bmatrix}$ $B=\begin{bmatrix} 2 & 5 \\ 1 & -6 \\ 8 & -4 \end{bmatrix}$

Then compute 3 A - B

$$3A - B = \begin{bmatrix} 3 & 6 \\ -24 & 9 \end{bmatrix} \begin{bmatrix} 2 & 5 \\ 1 & -6 \end{bmatrix} = \begin{bmatrix} 3-2 & 6-5 \\ -24-1 & 9-(-6) \end{bmatrix}$$

Find 2 A + B

2. If $A = \begin{pmatrix} -1 & 2 & 0 \\ 0 & 3 & 6 \end{pmatrix}$ and $B = \begin{pmatrix} 0 & -4 & 3 \\ 9 & -4 & -3 \end{pmatrix}$

Find A – B

3. Find the values of x and y given the following equation:

$$\begin{pmatrix} -3 & x \\ 2y & 0 \end{pmatrix} + \begin{pmatrix} 4 & 6 \\ -3 & 1 \end{pmatrix} = \begin{pmatrix} 1 & 7 \\ -5 & 1 \end{pmatrix}$$

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Reference Links:

http://en.wikipedia.org/wiki/Matrix_(mathematics)

http://en.wikipedia.org/wiki/Commutativity

http://en.wikipedia.org/wiki/Associativity

http://en.wikipedia.org/wiki/Additive_identity

http://en.wikipedia.org/wiki/Additive_inverse

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