Date 06/07/2020

class - XII th

Subject - Mathematics

Topic - Vector

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Problem:- If $\vec{a} = 2\hat{i} + 3\hat{j} + 4\hat{k}$ & $\vec{b} = 6\hat{i} - 4\hat{j} + 8\hat{k}$ & $\vec{c} = 3\hat{i} - 6\hat{j} + 5\hat{k}$ then find

(i) $\vec{a} + \vec{b}$ (ii) $\vec{b} + \vec{c}$ (iii) $|\vec{a} + \vec{b}|$ (iv) $|\vec{b} - \vec{c}|$

Solution:- (i) $\vec{a} + \vec{b} = (2\hat{i} + 3\hat{j} + 4\hat{k}) + (6\hat{i} - 4\hat{j} + 8\hat{k})$

$= (2\hat{i} + 6\hat{i}) + (3\hat{j} - 4\hat{j}) + (4 + 8)\hat{k}$

$= 8\hat{i} - \hat{j} + 12\hat{k}$

(ii) $\vec{b} + \vec{c} = (6\hat{i} - 4\hat{j} + 8\hat{k}) + (3\hat{i} - 6\hat{j} + 5\hat{k})$

$= (6\hat{i} + 3\hat{i}) - (4\hat{j} + 6\hat{j}) + (8\hat{k} + 5\hat{k})$

$= 9\hat{i} - 10\hat{j} + 13\hat{k}$

(iii) $|\vec{a} + \vec{b}| = |8\hat{i} - \hat{j} + 12\hat{k}|$

$= \sqrt{(8)^2 + (-1)^2 + (12)^2}$

$= \sqrt{64 + 1 + 144}$

$= \sqrt{209}$

(iv) $|\vec{b} - \vec{c}| = |6\hat{i} - 4\hat{j} + 8\hat{k} - 3\hat{i} + 6\hat{j} - 5\hat{k}|$

$= |3\hat{i} + 2\hat{j} + 3\hat{k}|$

$= \sqrt{9 + 4 + 9} = \sqrt{22}$

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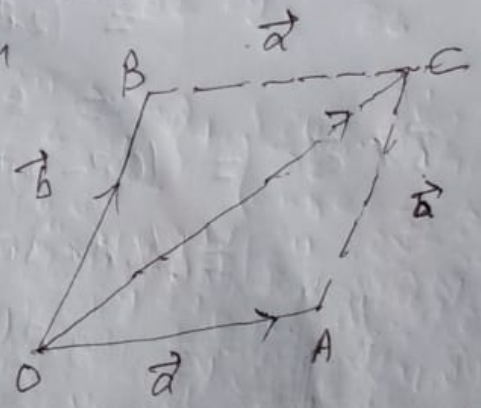
Problem 2:- Write and explain Parallelogram law of addition of vectors.

Solution: Parallelogram Law of addition of vectors :- It states that if a parallelogram is made with the help of two adjacent vectors then its diagonal will represent addition of these two vectors.

Let a parallelogram OACB is made with the help of two adjacent vectors $\vec{OA} = \vec{a}$ and $\vec{OB} = \vec{b}$. Met O with C. $\vec{OC}$ represents diagonal of parallelogram OACB.



In $\triangle OAC$

$\vec{OA} + \vec{AC} = \vec{OC}$ (from triangle law)

$\vec{a} + \vec{b} = \vec{OC}$ (1) [$\because \vec{OB} \parallel \vec{AC}$]

Also in $\triangle OBC$

$\vec{OB} + \vec{BC} = \vec{OC}$ (from $\triangle$'s law)

$\vec{OB} + \vec{OA} = \vec{OC}$ [$\because \vec{OA} = \vec{AC}$]

$\vec{b} + \vec{a} = \vec{OC}$ (2)

$\therefore$ from (1) & (2)

$\vec{a} + \vec{b} = \vec{b} + \vec{a} = \vec{OC}$

proved.