Nishant Jindal

VECTOR

(*) Representation of vector :→

(Head of the vector) (Final position)

B

$\overrightarrow{AB}$

Tail

B (Initial)

A (Tail of the Vector)

(Initial position)

$\overrightarrow{BA}$

(Head) A (Final)

(XX)

$\overrightarrow{AB} = |\overrightarrow{AB}|\,\hat{AB}$

$|\overrightarrow{AB}| = AB$

Magnitude of AB

$\hat{AB}$ Cap → Direction of $\overrightarrow{AB}$

→ Magnitude of AB

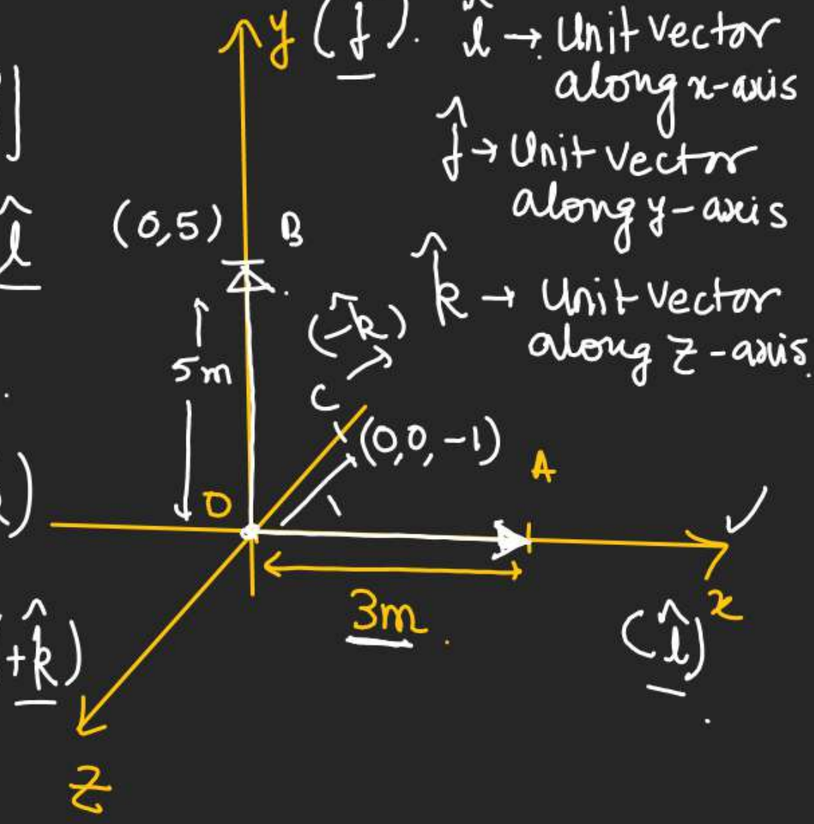
Position Vector :-

$\overrightarrow{OA} = |\overrightarrow{OA}|$

$\overrightarrow{OA} = 3\hat{i}$

$\overrightarrow{OB} = 5\hat{j}$

$\overrightarrow{OC} = (1)(-\hat{k})$



$\hat{i}$ → Unit vector along x-axis

$\hat{j}$ → Unit vector along y-axis

$\hat{k}$ → Unit vector along z-axis

Unit vector

↳ It has magnitud 1 unit

$|\hat{i}| = |\hat{j}| = |\hat{k}| = 1$

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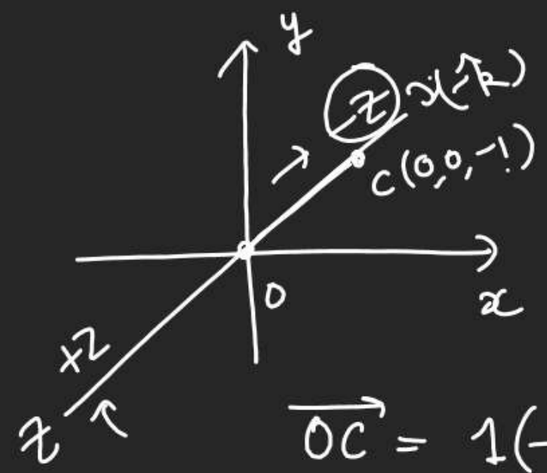


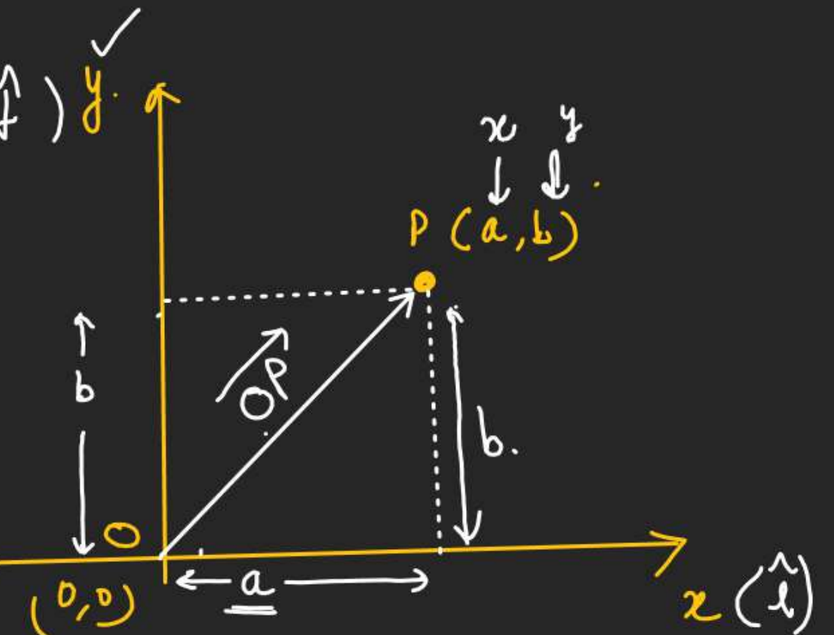
$\overrightarrow{OC} = 1(-\hat{k})$

$= -\hat{k}$

$\overrightarrow{OP} = |\overrightarrow{OP}|(\hat{OP})$

Initial Final

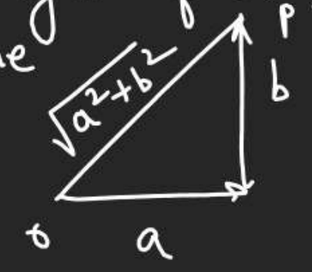
$\overrightarrow{OP} = a\hat{i} + b\hat{j}$



Coff^{n} of $\hat{i}$ = [magnitude of vector along x-axis or Component of vector along x-axis.

Coff^{n} of $\hat{j}$ ⇒ [Magnitude of vector along y-axis. or Component of vector along y-axis

$|\overrightarrow{OP}|$ = Length of OP line



$|\overrightarrow{OP}| = \sqrt{a^2+b^2}$

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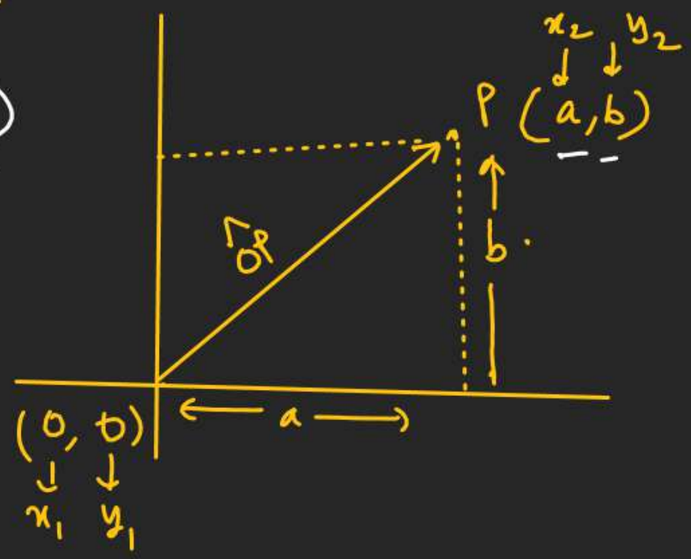
$\vec{OP} = a\hat{i} + b\hat{j}$

$|\vec{OP}| = \sqrt{a^2+b^2}$

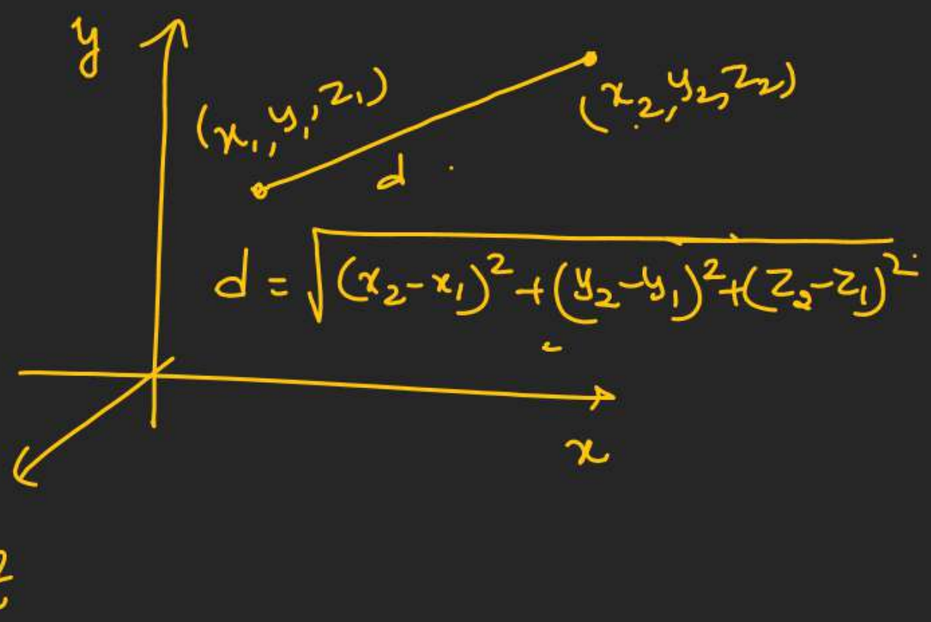
$\vec{OP} = |\vec{OP}|\,(\hat{OP})$

$\hat{OP} = \dfrac{\vec{OP}}{|\vec{OP}|}$

$\hat{OP} = \dfrac{a\hat{i}+b\hat{j}}{(\sqrt{a^2+b^2})} = \left(\dfrac{a}{\sqrt{a^2+b^2}}\right)\hat{i} + \left(\dfrac{b}{\sqrt{a^2+b^2}}\right)\hat{j}$



Distance formula



$d = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2+(z_2-z_1)^2}$

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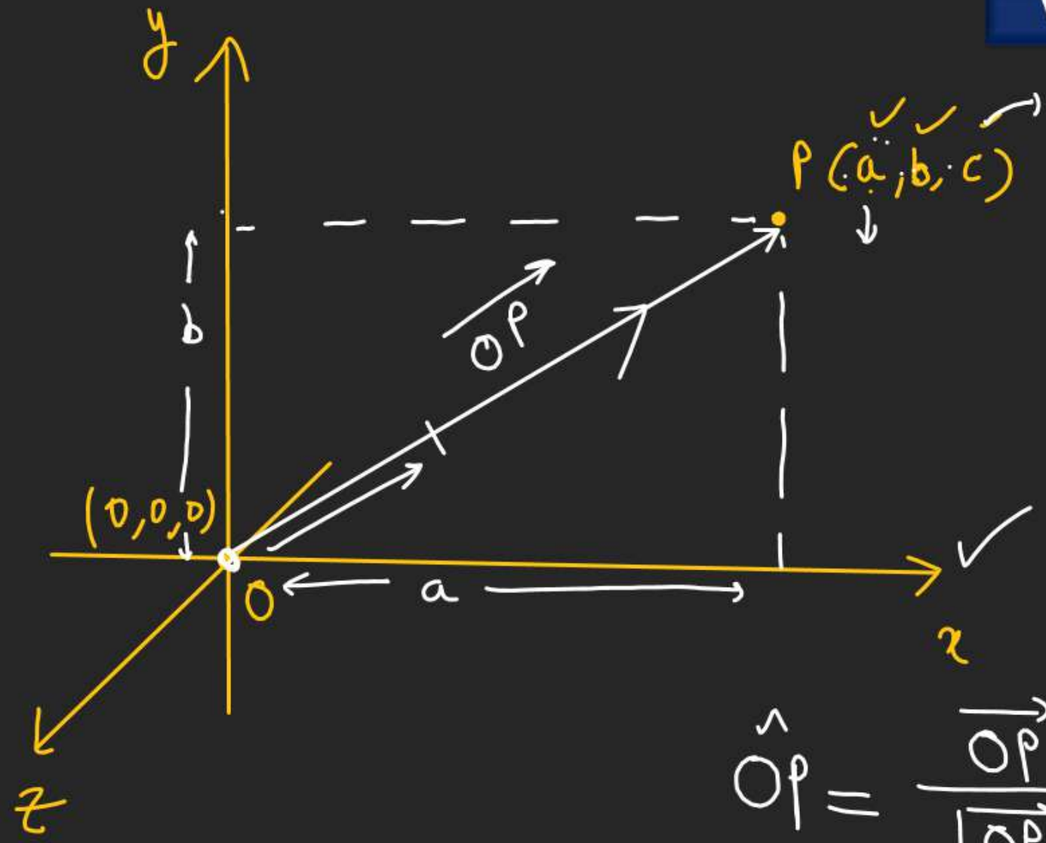

$$\vec{r} = |\vec{r}|\,\hat{r}$$

$$\hat{r} = \frac{\vec{r}}{|\vec{r}|}$$

$$\vec{OP} = a\hat{i} + b\hat{j} + c\hat{k}$$

$$|\vec{OP}| = \sqrt{a^2 + b^2 + c^2}$$

↳ By distance formula $= \sqrt{(a-0)^2 + (b-0)^2 + (c-0)^2}$

$$\hat{OP} = \frac{\vec{OP}}{|\vec{OP}|} = \frac{a\hat{i} + b\hat{j} + c\hat{k}}{\sqrt{a^2+b^2+c^2}}$$

$$\hat{OP} = \left(\frac{a}{\sqrt{a^2+b^2+c^2}}\right)\hat{i} + \left(\frac{b}{\sqrt{a^2+b^2+c^2}}\right)\hat{j} + \left(\frac{c}{\sqrt{a^2+b^2+c^2}}\right)\hat{k}$$

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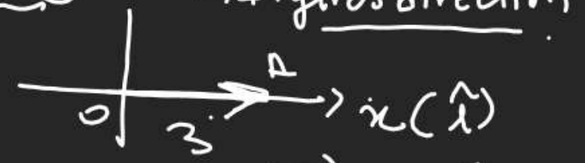
VECTOR

$\vec{r} = |\vec{r}|\hat{r}$ ... $|\hat{r}| = 1$ ↳ It gives direction

a) Find the magnitude and direction of vector.

$\vec{r} = 3\hat{i} + 4\hat{j}$



$\vec{OA} = 3\hat{i}$

b) Find a vector whose modulus is $\frac{2}{5}$ and which is directed along $\vec{r}$

Sol^n

$\vec{r} = 3\hat{i} + 4\hat{j}$

$|\vec{r}| = \sqrt{(3)^2 + (4)^2}$

$= \sqrt{9+16}$

$= 5$ ✓

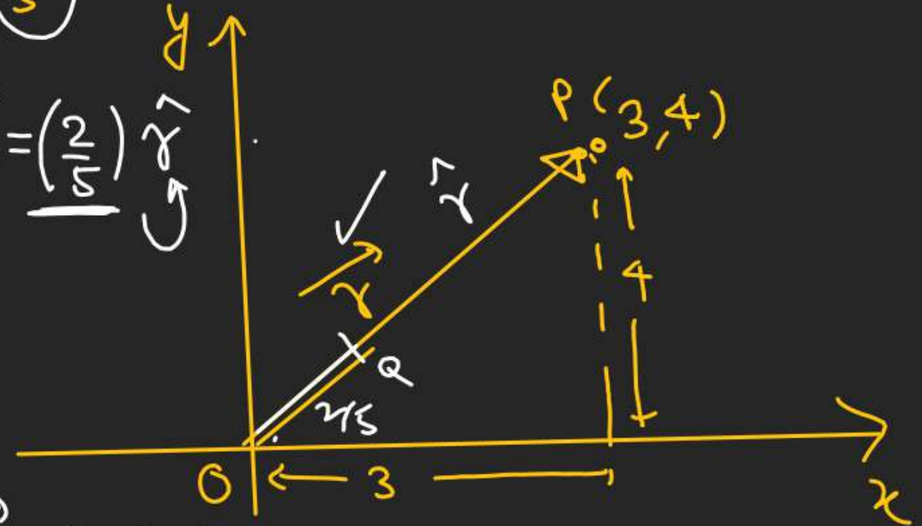
$\vec{r} = |\vec{r}|\hat{r}$

$\hat{r} = \frac{\vec{r}}{|\vec{r}|}$

$\hat{r} = \frac{(3\hat{i} + 4\hat{j})}{5}$

$\hat{r} = \frac{3}{5}\hat{i} + \frac{4}{5}\hat{j}$

$\vec{OQ} = \left(\frac{2}{5}\right)\hat{r}$



$\vec{OQ} = \frac{2}{5}\left(\frac{3}{5}\hat{i} + \frac{4}{5}\hat{j}\right)$

$\vec{OQ} = \frac{6}{25}\hat{i} + \frac{8}{25}\hat{j}$

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VECTOR

Write a vector whose modulus is equal to the vector $(2\hat{i}-2\hat{j})$ and whose direction is along $\hat{i}+\hat{j}$.

$\vec{r}_2$

$\vec{r}_1 = 2\hat{i}-2\hat{j}$

$\Rightarrow \vec{r}_2 = (1)\hat{i}+(1)\hat{j}$

Let, our vector is $\vec{r}$

$$\vec{r} = |\vec{r}|\,\hat{r}$$

According to question $\Rightarrow |\vec{r}| = |\vec{r}_1| = \sqrt{(2)^2+(-2)^2}$

$$= 2\sqrt{2}$$

$$|\hat{r}| = |\hat{r}_2| = \frac{\vec{r}_2}{|\vec{r}_2|} = \frac{\hat{i}+\hat{j}}{\sqrt{(1)^2+(1)^2}} = \left(\frac{\hat{i}+\hat{j}}{\sqrt{2}}\right)$$

$$\vec{r} = (2\sqrt{2})\left(\frac{\hat{i}+\hat{j}}{\sqrt{2}}\right)$$

$$\vec{r} = 2\hat{i}+2\hat{j} = 2(\hat{i}+\hat{j})$$

Ans

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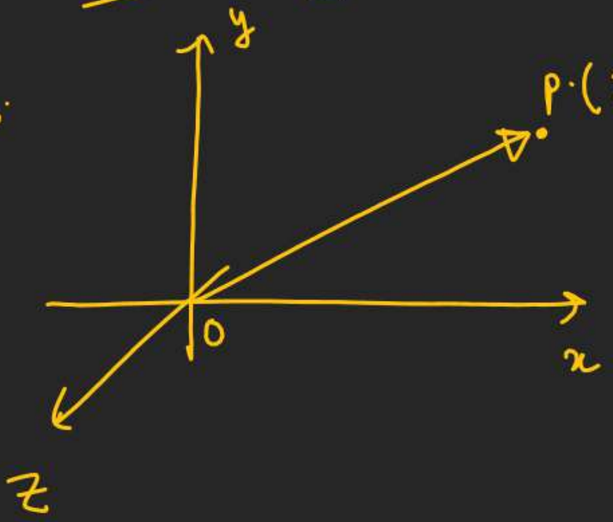
VECTOR

H.W . [Attempt]

#1.



a) Write $\overrightarrow{OP}$ = ?

b) Find $|\overrightarrow{OP}|$ = ?

c) Find $\hat{OP}$ = ?

#2. Write a vector whose initial Co-ordinate is (3,2,1) and final Co-ordinate is (5,4,3).

#③ Find the unit vector of $\vec{r} = -\hat{i}+\hat{j}+\hat{k}$.

#④ Find a vector whose Modulus is 5 and which is directed along vector $(3\hat{i}+4\hat{j})$

#⑤ Find a vector whose Modulus is equal to vector $(-2\hat{i}+\hat{j}+\hat{k})$ and which is directed along vector $(\hat{i}+\hat{j}+\hat{k})$

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VECTOR

(A)

Physical quantity

- Vector
  - i.e. Which has magnitude as well as direction and follow law of vector addition ;;
  - Ex:- [Displacement, Velocity, Acceleration]
- Scalar
  - [Which has only magnitude.]
  - Ex:- Distance, Speed

Ex:-

→ A Car is moving with 30 Km/h → "Speed".

→ A Car is moving with 30 Km/h in N-E (North-East)

(Velocity)