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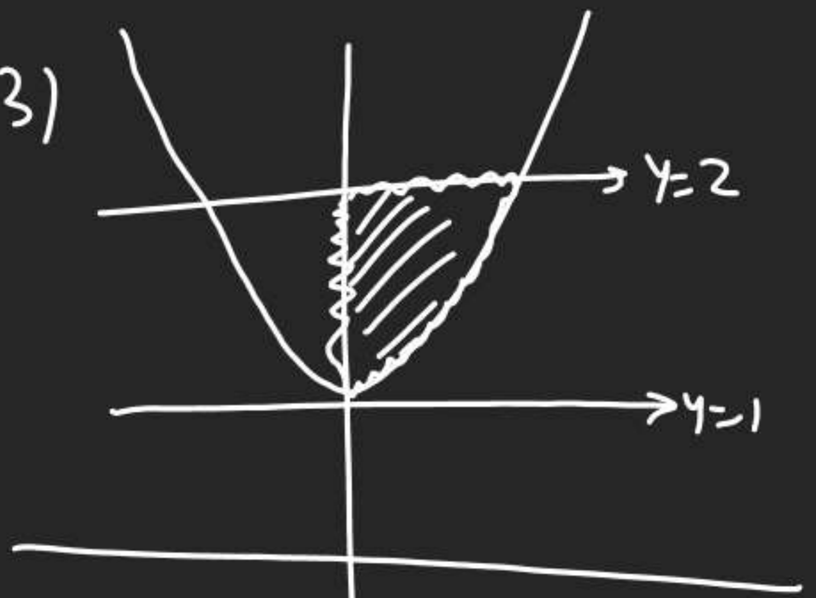
13)

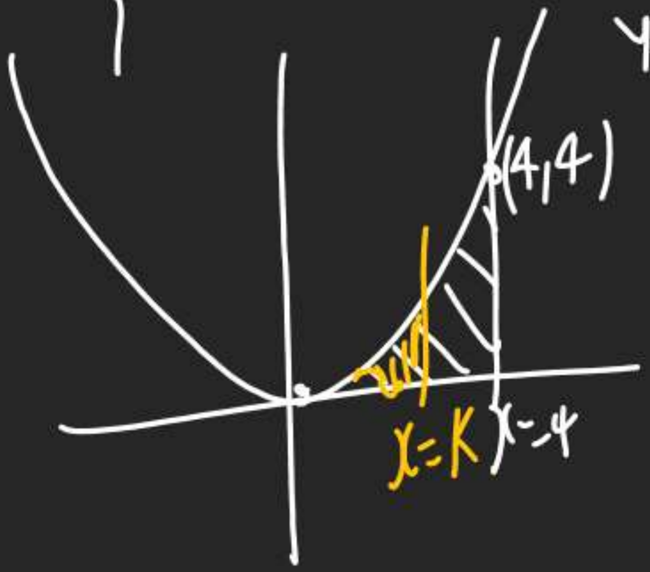


$y = \sec x$

$$\int_{y=1}^{y=2} x \cdot dy$$

$$A = \int_1^2 \sec^{-1} y \cdot 1 \cdot dy$$

(7)

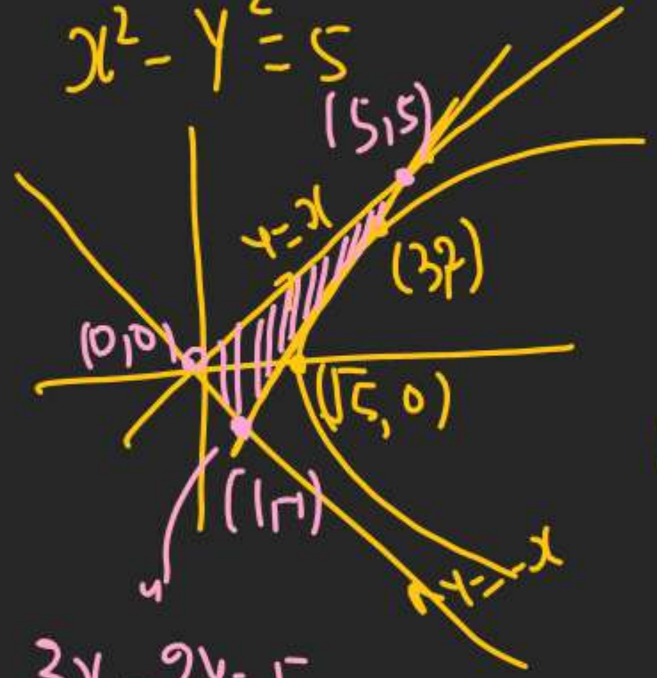


$y = \frac{x^2}{4}$

$$\int_0^K \frac{x^2}{4} \cdot dx = \frac{1}{2} \int_0^4 \frac{x^2}{4} dx$$

$K = ?$

$x^2 - y^2 = 5$



$3x - 2y = 5$

$y = -x$

$x = 1$

$y = -1$

$y = \sqrt{x^2 - 5}$

(51) $m_{\text{Tangent}} = \frac{1 \times 2x}{2\sqrt{x^2-5}} = \frac{3}{\sqrt{9-5}} = \frac{3}{2}$

(3,2)

Eq^n of tangent

$(y-2) = \frac{3}{2}(x-3)$

$2y - 4 = 3x - 9$

$3x - 2y = 5$

$y = x$

$x = 5$

$$\Delta = \frac{1}{2} \begin{vmatrix} 0 & 0 \\ 1 & -1 \\ 5 & 5 \\ 0 & 0 \end{vmatrix}$$

26) $f''(x) = f'(x)$

$f'(x) = f(x) + C$

$x = 0$ $f'(0) = f(0) + C$

$1 = 0 + C \Rightarrow C = 1$

$f'(x) = f(x) + 1$

$$\int \frac{f'(x)}{f(x)+1} = \int 1$$

$f(x) + 1 = t$

$f'(x) dx = dt$

$\int \frac{dt}{t} = x + C$

$\ln(f(x)+1) = x + C$

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Even $y^2 = x^2\left(\frac{1+x}{1-x}\right)$

$$y = x\sqrt{\frac{1+x}{1-x}}$$

↓

$$\frac{1+x}{1+x} \geq 0$$

$$\frac{x+1}{x-1} \leq 0$$

$+ \quad - \quad +$

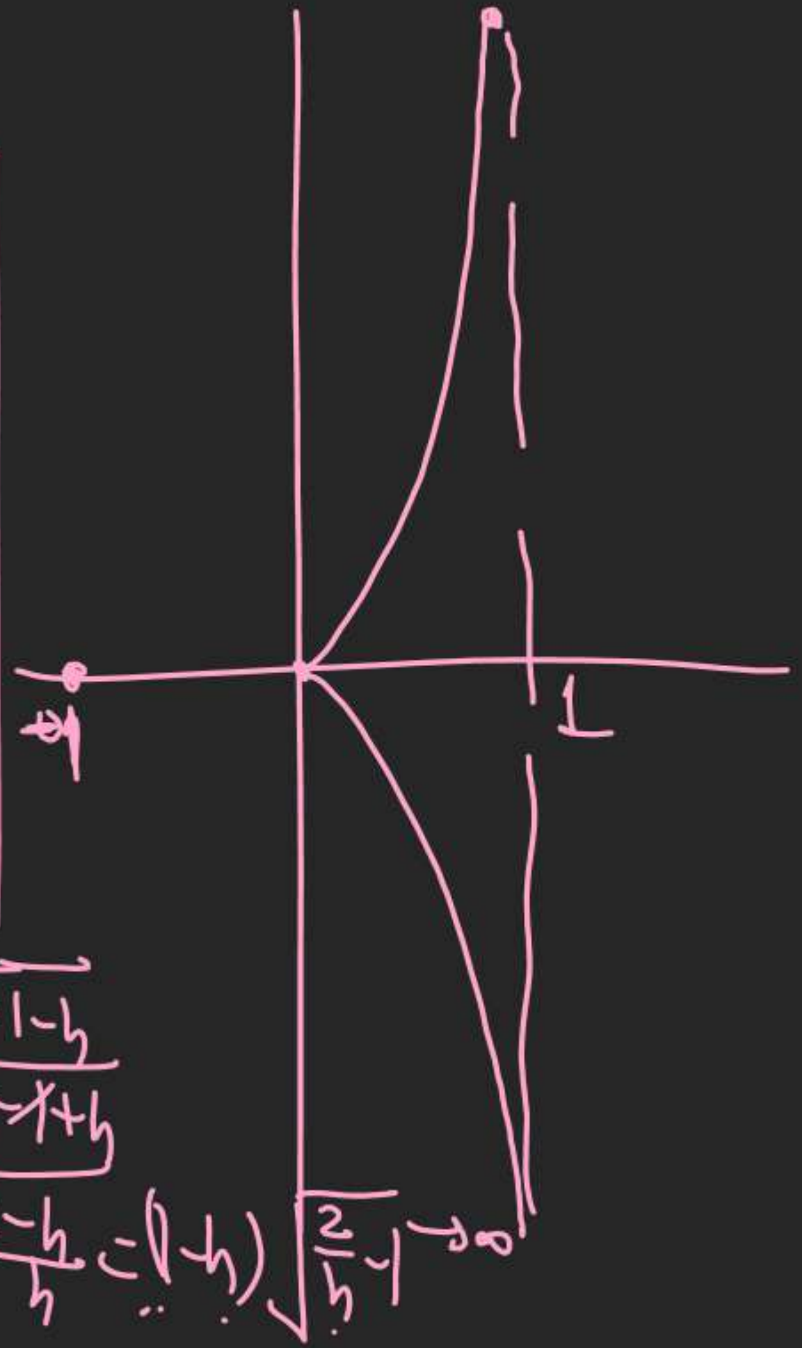
$-1 \quad 1$

$$-1 \leq x < 1$$

$f(0) = 0\sqrt{\frac{1+0}{1-0}}$

$$f(1^-) = (1-h)\sqrt{\frac{1+1-h}{\cancel{1}-\cancel{1}+h}}$$

$$= (1-h)\sqrt{\frac{2-h}{h}} = (1-h)\sqrt{\frac{2}{h}-1} \to \infty$$



$$\frac{dy}{dx} = x \times \frac{1}{2\sqrt{\frac{1+x}{1-x}}} \times \frac{(1-\cancel{x})+(1+\cancel{x})}{(1-x)^2} + \sqrt{\frac{1+x}{1-x}} \times 1 = 0$$

$$= x\sqrt{\frac{1-x}{1+x}} \times \frac{1}{(1-x)^2} = -\sqrt{\frac{1+x}{1-x}}$$

$$\Rightarrow \frac{x}{(1-x)^2} = -\sqrt{\cancel{\frac{1-x}{1+x}}} \times \sqrt{\cancel{\frac{1+x}{1-x}}}$$

$$\frac{3+\sqrt{5}}{2}$$

$$\Rightarrow \frac{x}{(1-x)^2} = -1 \Rightarrow (1-x)^2 = x$$

$$x = \frac{3 \pm \sqrt{5}}{2}$$

$$x^2 - 2x + 1 = x$$

$$x^2 - 3x + 1 = 0$$

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Vector-3D

3 Qs → Mains.
6 Qs → Adv.
} 10% hissa.

Weakness./Mistake.

↓

13–16 Lecture.

11–16 Strongly

1–7 L. 90%

8 — 16 → ↓ ↓ 10%

3 Lecture → Story Building.

4-5-6 → Dot / Vector.

Do as many Qs as Possible

2019 - 2023 → 5 Paper

85 Set × 3

= 250 Qs / 370

Vector + 3D के Qs

↓

$\boxed{\text{5 Lecture}}$

3D

(1) Dekhte hi Qs नहीं छोड़ो

(2) Full attn देनी पड़ेगी

(3) Concept सारे पता होने चाहिए

(4) Basic Qs पर सारा Load नहीं देना।

(5) Power Last तक बचा के रखनी है।

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Vector.

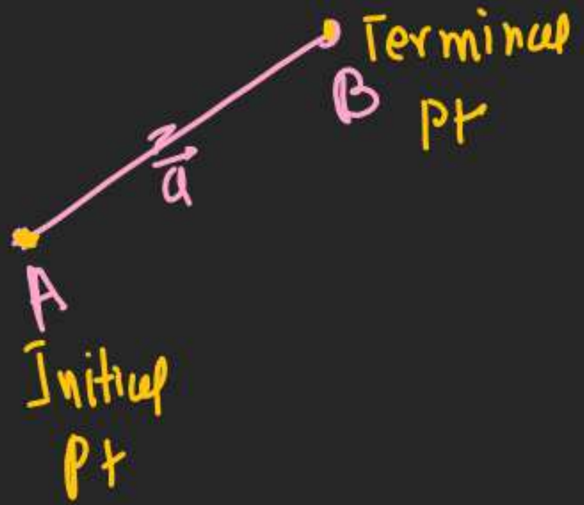
Physical Quantity

1) Vector Mag + Dir. Velocity Acceleration force.	Scalar. Mag. but No dir. mass / time / speed dist.
(2) It obey Δ law of addition.	

(2) Rep. of vector.

1) Vector is Rep. by a Line Segment.

2)



3) If above is denoted by $\vec{AB}$

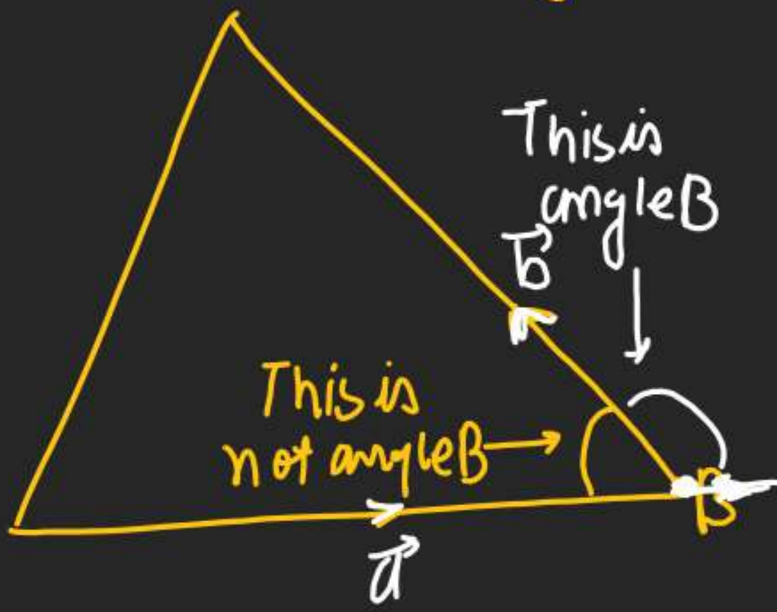
then Magnitude $= |\vec{AB}|$

Q magnitude of $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$

$|\vec{a}| = \sqrt{2^2 + (-1)^2 + 1^2} = \sqrt{6}$

(3) Angle betn 2 vectors.

A) We consider angle betn 2 vectors only when Rays are diverging.



(B) angle betn $\vec{a}$ & $\vec{b}$ is Rep. by $(\vec{a} \wedge \vec{b})$

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4) Types of Vector.

A) Null vector.

Zero vector.

① $|\vec{AB}| = 0$ then $\vec{AB}$ is Null Vector.

② $\vec{AA}$ is always a Null Vector

(3) No defined Direction.

Null vector can be used in any direction.

$\vec{a} \times \vec{b} = 0$ & $\vec{a} \cdot \vec{b} = 0$ both are given

$\vec{a} \parallel \vec{b}$ $\quad$ $\vec{a} \perp \vec{b}$

one of $\vec{a}$ or $\vec{b}$ is a null vector

(B) Unit vector.

① Unit vector of $\vec{a}$ is Rep. by $\hat{a}$

② $|\hat{a}| = 1$

(3) $\hat{a}$ Rep. direction of $\vec{a}$.

Unit vector mostly given to give director.

(4) Unit vector for X Axis $= \hat{i}$

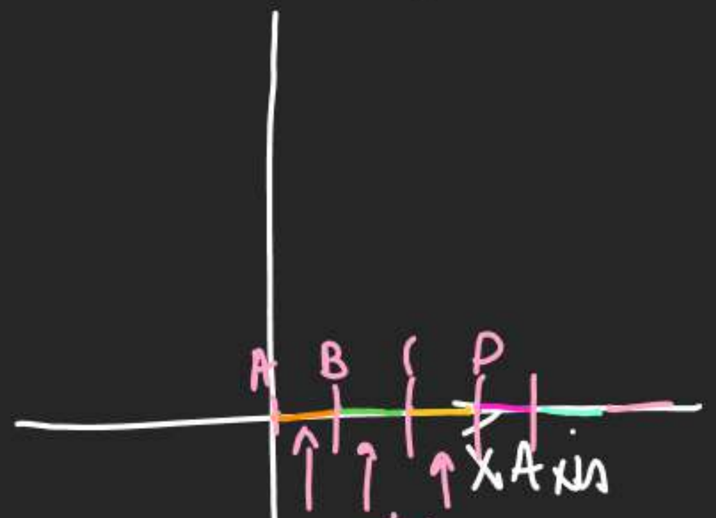
——— for y Axis $= \hat{j}$

——— for z axis $= \hat{k}$

(5) $\hat{a} = \dfrac{\vec{a}}{|a|}$

$\vec{a} = |\vec{a}| \cdot \hat{a}$

Vector. $\quad$ Mag × direction.



$\vec{AB} = \hat{i}$

$\vec{AC} = 2\hat{i}$

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

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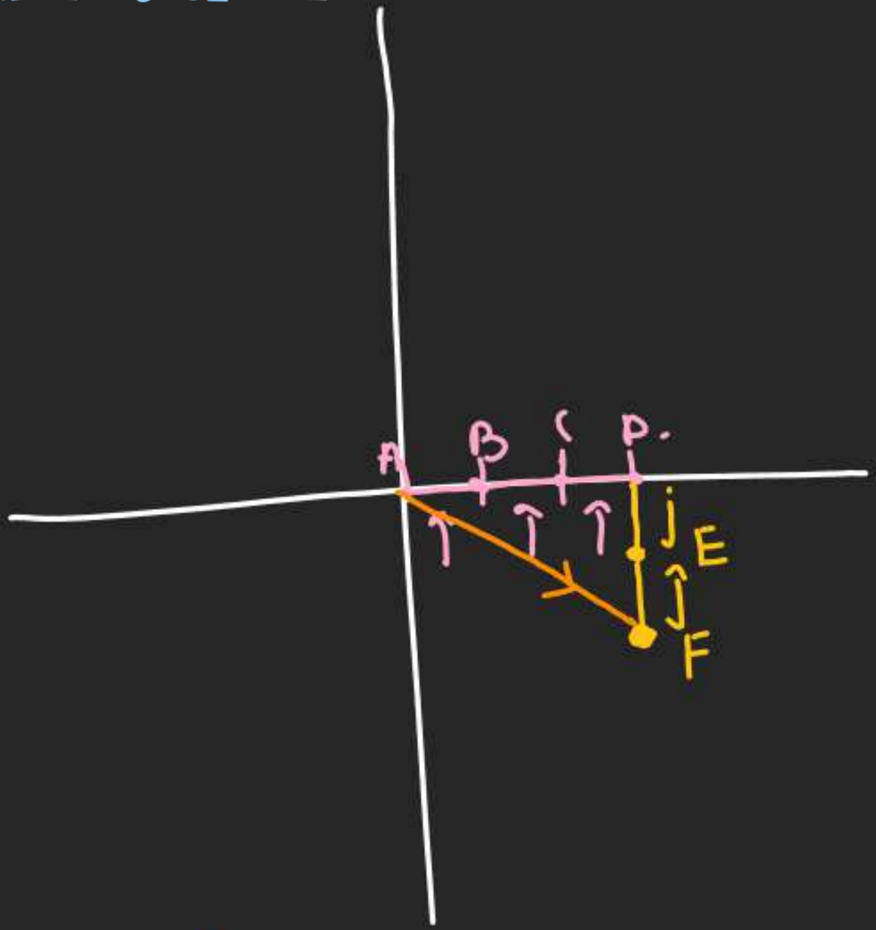


$\vec{AF} = 3\hat{i} - 2\hat{j}$

Position Vector.

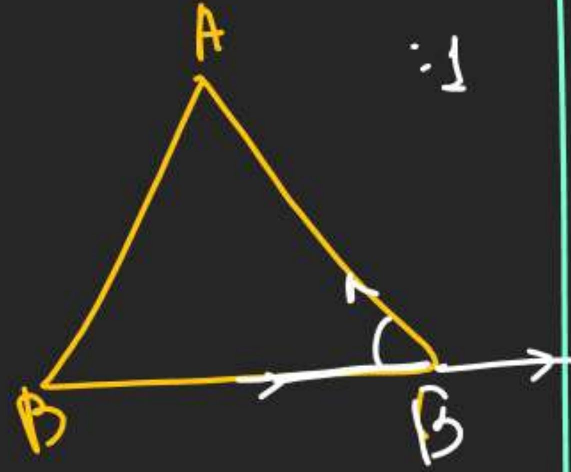
$\hat{a} = \frac{\vec{a}}{|a|}$

Unit vect:

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

$\text{Mag} = \sqrt{\left(\frac{1}{\sqrt{2}}\right)^2 + \left(\frac{1}{\sqrt{2}}\right)^2}$

$= 1$



(6) Unit vector in X-Y Plane is denoted by $\pm(\cos\theta\,\hat{i} + \sin\theta\,\hat{j})$

Q Find Unit vector $\parallel^{r}$ to $x - y = 1$

$\tan\theta = 1$

$\theta = 45^\circ$

Unit vector $\rightarrow \pm(\cos 45^\circ\,\hat{i} + \sin 45^\circ\,\hat{j})$

(7)

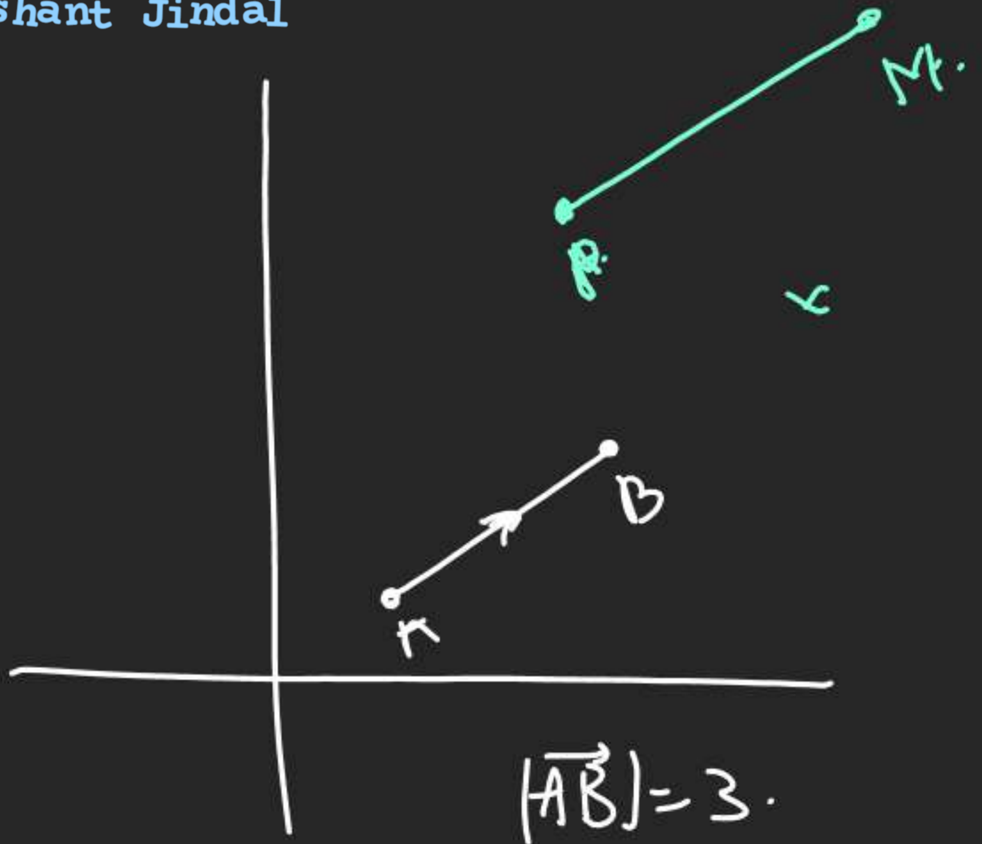
2 Unit vector are possible $\perp^{r}$ to a plane

(8) How many unit vectors are Possible $\perp^{r}$ to a Line.

∞ Unit vectors are Possible $\perp^{r}$ to a Line

(C) Free & localised vector.

When effect of a vector remain same while shifting them $\parallel^{rt}$ to its Position Vector is Free Vector.



$|\vec{AB}| = 3$

here. $\vec{PM} = \frac{3}{2}\vec{AB}$

2 meaning

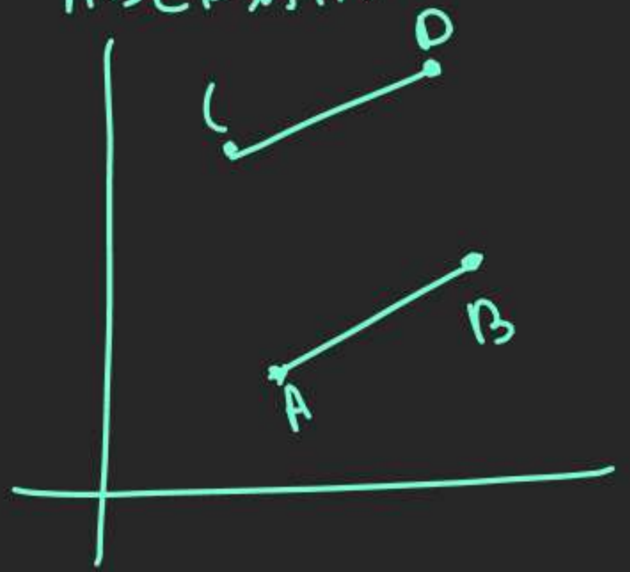
① Direction of PM = Dir. of AB

② Mag of PM = $\frac{3}{2}$ Mag of AB

Q If $\vec{AB} = \vec{CD}$ is given.

then: _ _ _ ?

ABCD is ||gm.



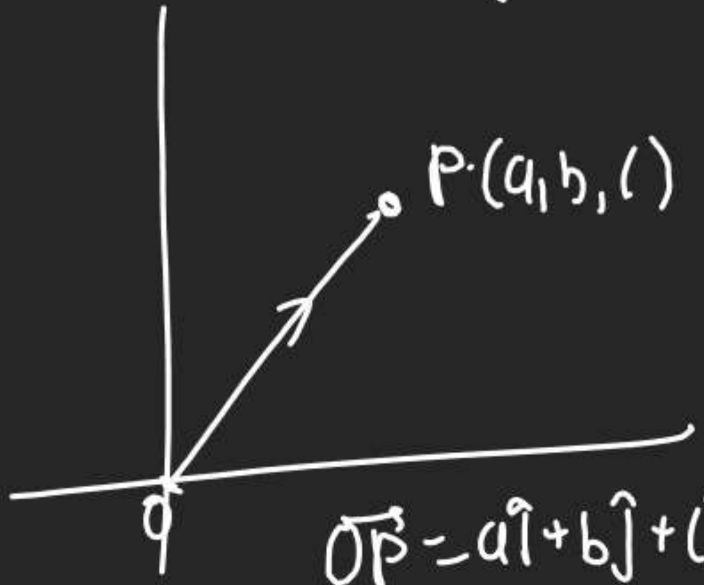
(D) Coinitial vectors

$\vec{AB}$ & $\vec{AM}$ are coinitial Vector.

as Both have same initial Pt. A.

(E) Position Vector.

A) $\vec{OP}$ is P.V. of $\vec{P}$.



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

P.V. = Rep. Position of Pt.

P w.r.t. fixed Pt. Origin.

$\vec{PM} = \vec{OM} - \vec{OP}$

tail-head.

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(F) Collinear Vector.

A) Vectors $\parallel^{rl}$ to Sameline = Collinear Vector

B) Same direction = Like vector.

C) opp. direction = Unlike "

(D) 2 Collinear vector are always in Same plane

(E)

① $\vec{AB}$ & $\vec{AC}$ are Collinear vector

② $\vec{AB} = \lambda \vec{AC}$

(3) $\vec{AB} \parallel \vec{AC}$

(4) $\vec{AB} = \lambda \vec{AC}$ If $\lambda < 0$ (unlike vector)

(G) $\parallel^{le}$ Vector.

① $\vec{AB} \parallel \vec{CD} \Rightarrow \vec{AB} = \lambda \vec{CD}$.

(H) Base Vector.

① If $\vec{a} = a_1\hat{i} + a_2\hat{j} + a_3\hat{k}$ then $\hat{i}, \hat{j}, \hat{k}$ are Base Vectors.

(2) No 2 Base Vectors can be Rep. in terms of eachothers. $\Rightarrow \hat{i} = 2\hat{j}$ not Possible

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3) $|\vec{AB}| = |\vec{b} - \vec{a}|$

$$= \left|(b_1 - a_1)\hat{i} + (b_2 - a_2)\hat{j} + (b_3 - a_3)\hat{k}\right|$$

$$|\vec{AB}| = \sqrt{(b_1 - a_1)^2 + (b_2 - a_2)^2 + (b_3 - a_2)^2}$$

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

here $\vec{a}$ is Linear Combination of $\hat{i}, \hat{j}, \hat{k}$

(5) $\vec{a} \parallel \vec{b} \Rightarrow \boxed{\vec{a} = \lambda \vec{b}}$

$$a_1\hat{i} + a_2\hat{j} + a_3\hat{k} = \lambda(b_1\hat{i} + b_2\hat{j} + b_3\hat{k})$$

$a_1 = \lambda b_1$ & $a_2 = \lambda b_2$ & $a_3 = \lambda b_3$

$\lambda = \frac{a_1}{b_1}$ | $\lambda = \frac{a_2}{b_2}$ | $\lambda = \frac{a_3}{b_3}$

$$\frac{a_1}{b_1} = \frac{a_2}{b_2} = \frac{a_3}{b_3}$$