Nishant Jindal

Q If $P(1,0)$, $q(-1,0)$, $r(2,0)$

then find Locus of a Pt S, such that $Sq^2 + Sr^2 = 2Sp^2$

A) Line $\parallel^{el}$ to x Axis

B) Line $\parallel^{el}$ to y Axis

C) Circle (D) NOT.

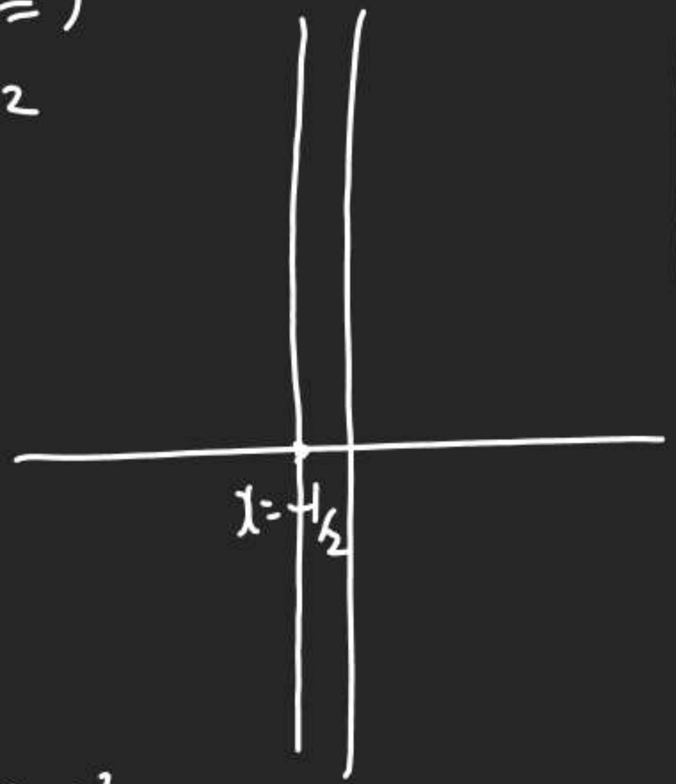
① let $S = (h,K)$

$$(Sq)^2 + (Sr)^2 = 2(Sp)^2$$

$$(h+1)^2+(K-0)^2+(h-2)^2+(K-0)^2 = 2\{(h-1)^2+(K-0)^2\}$$

$$\cancel{h^2}+2h+1+\cancel{K^2}+\cancel{h^2}-\cancel{4h}+4+\cancel{K^2} = \cancel{2h^2}-\cancel{4h}+4+\cancel{2K^2}$$

$$2h+5 = 4 \Rightarrow h = -\tfrac{1}{2} \Rightarrow x = -\tfrac{1}{2}$$



Q8 Find locus of a Pt such that sum of its distance from $(0,2)$ & $(0,-2)$ is 6.

① Let Pt (h,K)

② $\sqrt{(h-0)^2+(K-2)^2} + \sqrt{(h-0)^2+(K+2)^2} = 6$

$$\sqrt{h^2+(K-2)^2} = 6 - \sqrt{h^2+(K+2)^2}$$

$$\cancel{h^2}+(K-2)^2 = 36 + \cancel{h^2}+(K+2)^2 - 12\sqrt{h^2+(K+2)^2}$$

$$\cancel{K^2}-4K+\cancel{4} = 36+\cancel{K^2}+4K+\cancel{4} - 12\sqrt{h^2+(K+2)^2}$$

$$3\,\cancel{12}\sqrt{h^2+(K+2)^2} = \cancel{8}^{\,2}K + \cancel{36}^{\,9}$$

$$9(h^2+K^2+4K+4) = 4K^2+81+36K$$

Extraaa Note

$9x^2+5y^2 = 45$

Ellipse

Q Find locus of following.

(1) $x = a\cos\theta,\ y = a\sin\theta,\ \theta \in R$.

A) $\cos\theta = \frac{x}{a},\ \sin\theta = \frac{y}{a}$

B) Use Trig o Identity

$$\sin^2\theta + \cos^2\theta = 1$$

$$\frac{x^2}{a^2} + \frac{y^2}{a^2} = 1$$

$\boxed{x^2 + y^2 = a^2}$ is locus

(2) $x = a\sec\theta,\ y = b\tan\theta,\ \theta \in R - (2n+1)\frac{\pi}{2}$

$\sec\theta = \frac{x}{a},\ \tan\theta = \frac{y}{b}$

A) $\sec^2\theta - \tan^2\theta = 1$

B) $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$

(3) $x = at^2,\ \underline{y = 2at},\ t \in R$

$t = \frac{y}{2a}$

$$x = a\cdot\left(\frac{y}{2a}\right)^2 = a\cdot\frac{y^2}{4a^2}$$

$\boxed{y^2 = 4ax}$

(4) $x = 2at,\ y = at^2$

$t = \frac{x}{2a}$ | $y = a\cdot\frac{x^2}{4a^2}$

$$x^2 = 4ay$$

(5) $x = a\cos\theta + b\sin\theta$

$y = a\sin\theta - b\cos\theta,\ \theta \in R$.

Sq & Add

$x^2 = a^2\cos^2\theta + b^2\sin^2\theta + 2ab\sin\theta\cos\theta$

$y^2 = a^2\sin^2\theta + b^2\cos^2\theta - 2ab\sin\theta\cos\theta$

$x^2 + y^2 = a^2 + b^2$ ← Locus.

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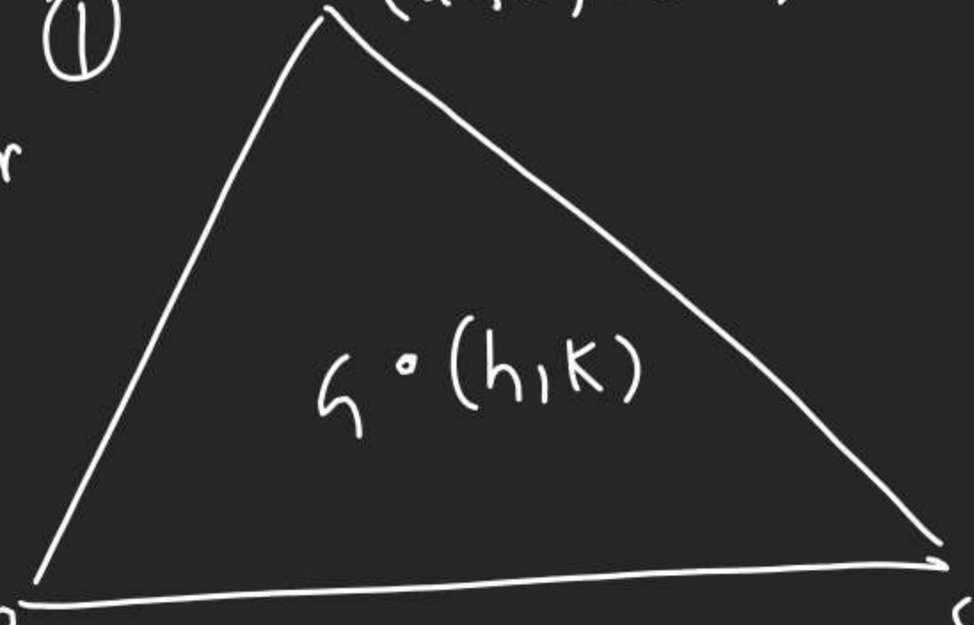
Q6. If $A(a\cos\theta, a\sin\theta)$, $B(b\sin\theta, -b\cos\theta)$

$C(1,2)$ find locus of centroid of ΔABC.

① Regular Class लिखिए।



$$h = \frac{a\cos\theta + b\sin\theta + 1}{3} \quad \bigg| \quad k = \frac{a\sin\theta - b\cos\theta + 2}{3}$$

$$a\cos\theta + b\sin\theta = 3h - 1 \rightarrow (A) \quad \bigg| \quad a\sin\theta - b\cos\theta = 3k - 2 \rightarrow (B)$$

$A^2 + B^2$

$$a^2 + b^2 = (3h-1)^2 + (3k-2)^2$$

$$\boxed{(3x-1)^2 + (3y-2)^2 = a^2 + b^2} \text{ locus.}$$

good Students

$$\underbrace{\left(x - \tfrac{1}{3}\right)^2 + \left(y - \tfrac{2}{3}\right)^2 = \frac{a^2 + b^2}{9}}_{\text{Circle}}$$

Q. $\underbrace{x = t^2 + t + 1,\ y = t^2 - t + 1}$ Locus?

x, y दोनों t पर depend है

t को हटा कर x, y के बीच Rel.

आएगा वो Locus है

① $x = t^2 + t + 1$

$\underline{y = t^2 - t + 1}$

$x - y = 2t \Rightarrow t = \dfrac{x-y}{2}$

② Value of t putting in x OR y

$x = t^2 + t + 1$

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

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Q 8 $x = \frac{e^t + e^{-t}}{2}$, $y = \frac{e^t - e^{-t}}{3}$ Locus?

① $2x = e^t + e^{-t}$

$3y = e^t - e^{-t}$

② Sqr

$4x^2 = \cancel{e^{2t}} + \cancel{e^{-2t}} + 2\cancel{e^t}\cdot\cancel{e^{-t}}$

$9y^2 = \cancel{e^{2t}} + \cancel{e^{-2t}} - 2\cancel{e^t}\cdot\cancel{e^{-t}}$

$-\quad -\quad -\quad +$

$4x^2 - 9y^2 = 4$ → Locus

Q9 $x = a\left(t + \frac{1}{t}\right)$

$y = b\left(t - \frac{1}{t}\right)$ Locus?

$\frac{x}{a} = t + \frac{1}{t}$ | $\frac{y}{b} = t - \frac{1}{t}$

Sqr & minus

$\frac{x^2}{a^2} = \cancel{t^2} + \cancel{\frac{1}{t^2}} + 2t \times \frac{1}{t}$

$\frac{y^2}{b^2} = \cancel{t^2} + \cancel{\frac{1}{t^2}} - 2\cancel{t} \times \frac{1}{\cancel{t}}$

$-\quad -\quad -\quad +$

$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 4$

Q $ax + by = 4t$ Locus?

$ax t - by t = 4$

$ax + by = 4t$

& $ax - by = \frac{4}{t}$

Multiply and eliminate t

$(ax + by)(ax - by) = 4\cancel{t} \times \frac{4}{\cancel{t}}$

$a^2x^2 - b^2y^2 = 16$

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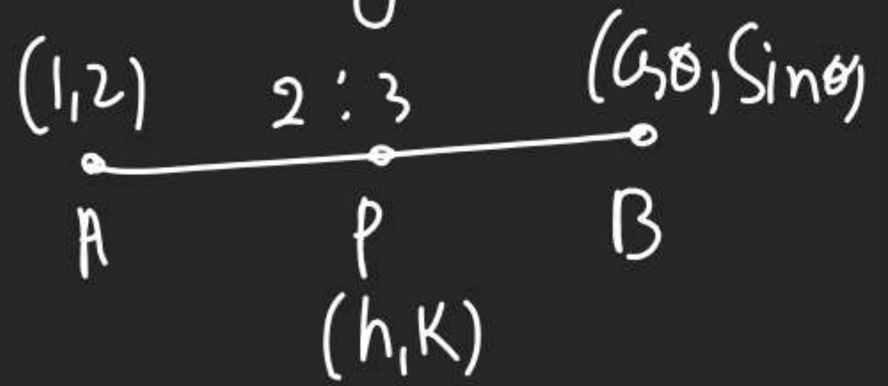
Q 11 $A(1,2)$, $B=(\cos\theta, \sin\theta)$

find locus of Pt. P dividing Line Joining AB in 2 : 3)



$$h=\frac{2\cos\theta+3\times 1}{5} \quad\Big|\quad K=\frac{2\sin\theta+6}{5}$$

$$\cos\theta=\frac{5h-3}{2} \quad\Big|\quad \sin\theta=\frac{5K-6}{2}$$

$$\sin^2\theta+\cos^2\theta=1$$

$$\left(\frac{5h-3}{2}\right)^2+\left(\frac{5K-6}{2}\right)^2=1$$

$$(5x-3)^2+(5y-6)^2=4$$

Locus के Qs में
1) Trigo Id.
2) Trigo Ratio.
3) ⊥r dist. fon.
4) Sq. & Add.
5) any Universal form.

Rod वाले Qs.

A Rod of Length L Slides along Coord. Axes such that it's end Pts always lies on X Axis & Y Axis find

① Locus of mid Pt. of rod at its every Pt

② Locus of Circumcentre of the Δ made by rod & Coord Axes

(3) Locus of Centroid of Δ made by Rod & Coord Axes.

(4) If L is 4 then find the locus of the Pt. Which divides the Rod length in 1:2 ratio measured from X Axis.

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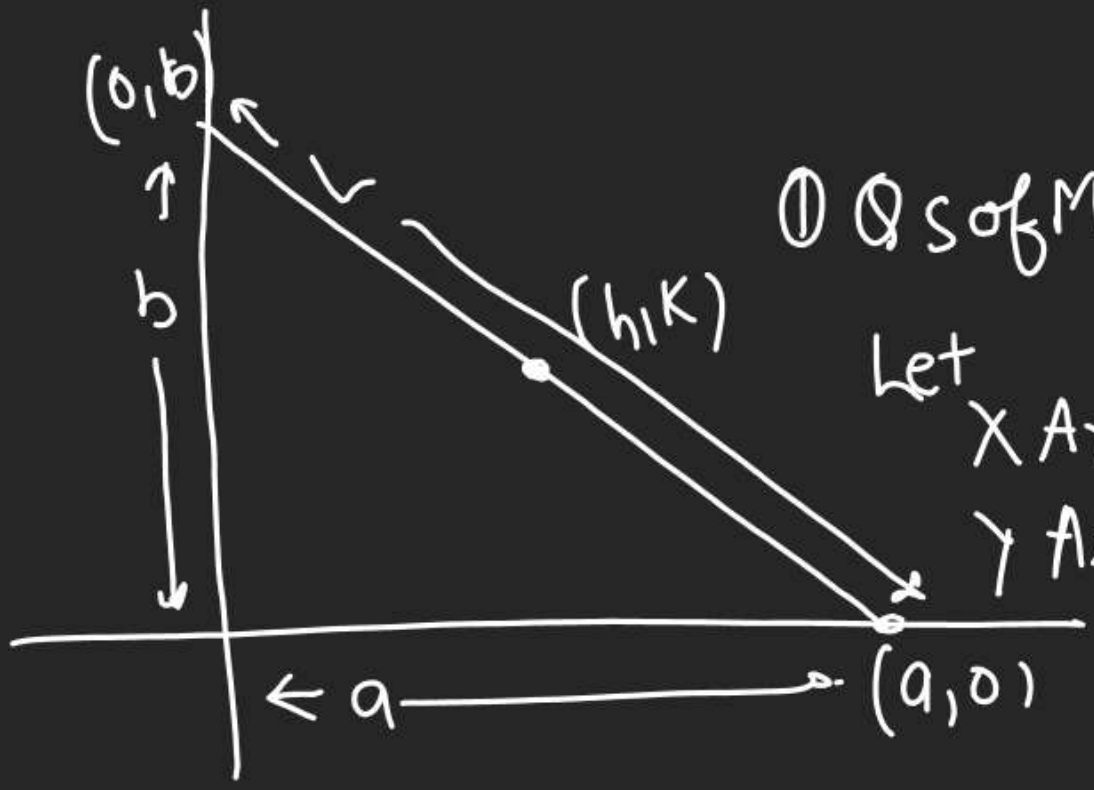

① Qs of Mid Pt. = (h,K)

Let

X Axis → (a,0)

Y Axis → (0,b)

$L = \sqrt{a^2+b^2}$

Mid Pt → $(h,K) \Rightarrow h = \frac{a+0}{2} \quad \Big| \quad K = \frac{0+b}{2}$

$a = 2h, \; b = 2K.$

$\therefore L = \sqrt{4h^2+4K^2}$

$\boxed{L^2 = 4x^2+4y^2}$ → locus of MP.

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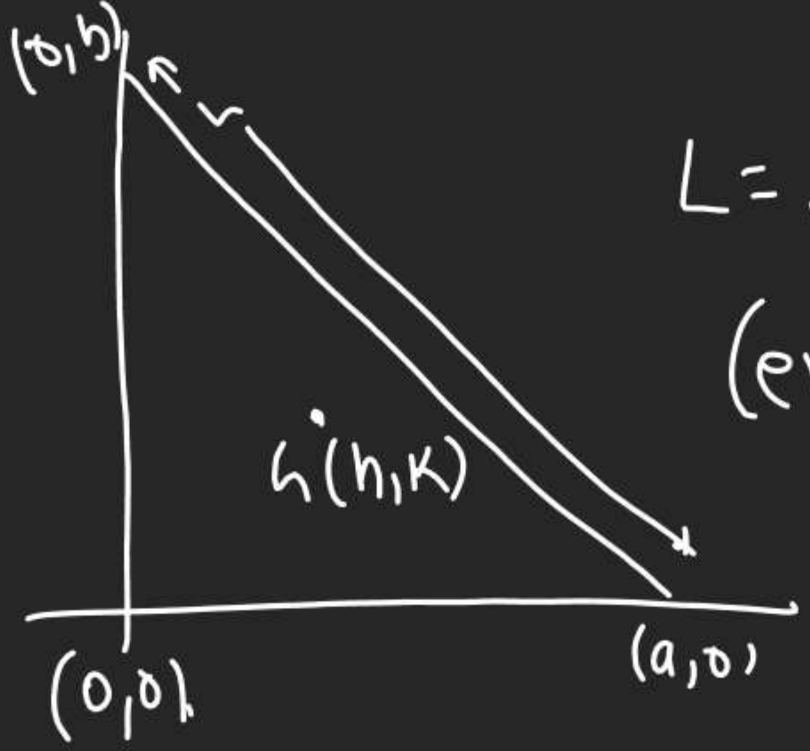
(3)



$L=\sqrt{a^2+b^2}$

Centroid $=(h,K)$

$h=\dfrac{a+0+0}{3}$ | $K=\dfrac{0+0+b}{3}$

$a=3h$ $\qquad$ $b=3K$

$L=\sqrt{(3h)^2+(3K)^2}$

$9h^2+9K^2=L^2$

$9x^2+9y^2=L^2$

$$\boxed{x^2+y^2=\frac{L^2}{9}}$$

Rod वाले Qs.

Q. A Rod of Length L Slides along Coord. Axes Such that it's end Pts always lies on X Axis & y Axis find

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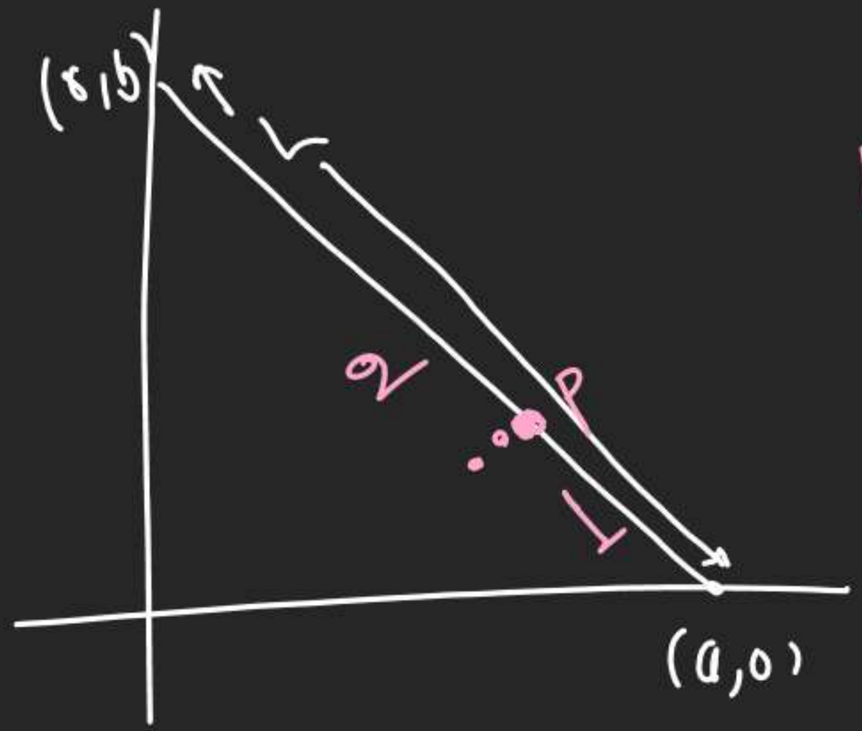
(4)



$L = \sqrt{a^2+b^2}$

$P = (h,k)$

$h = \dfrac{1\times 0+2a}{3}$ | $k = \dfrac{1\times b+2\times 0}{3}$

$a = \dfrac{3h}{2}$ $\quad b = 3k$

$\therefore 4 = \sqrt{\dfrac{9h^2}{4} + 9k^2}$

$\Rightarrow \boxed{16 = \dfrac{9x^2}{4} + 9y^2}$

Rod वाले Qs.

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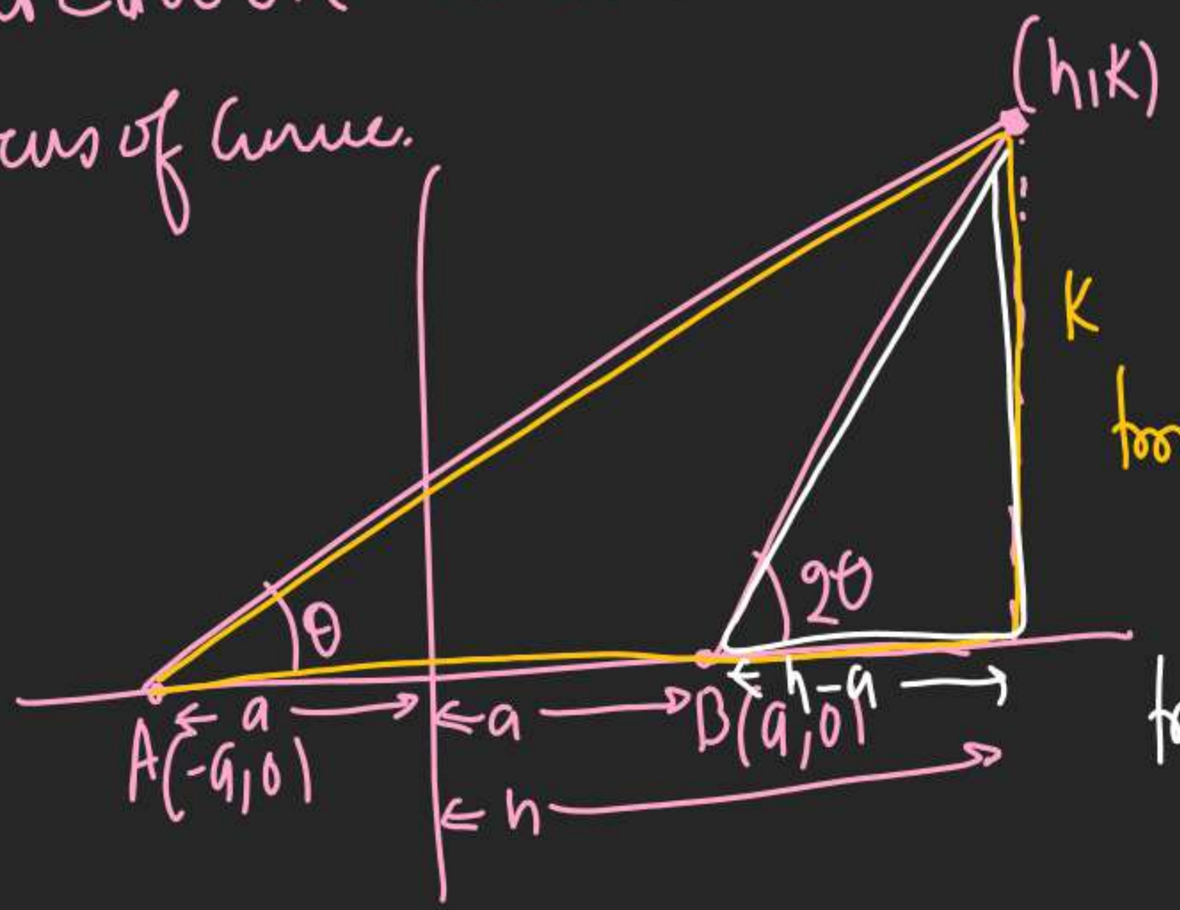
Q. 2 St. line Rotate about 2 fixed Pts (−a, 0) & (a, 0) in A.C.W Sense If they start from their position of Coincidence such that one Rotates at a Rate double to another. find Locus of Curve.



$\tan\theta = \frac{k}{h+a}$

$\tan 2\theta = \frac{k}{h-a}$

$$\tan 2\theta = \frac{2\tan\theta}{1-\tan^2\theta}$$

$$\frac{k}{h-a} = \frac{2\frac{k}{h+a}}{1-\frac{k^2}{(h+a)^2}}$$

SAG.

$x^2+y^2-2ax-3a^2=0$

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Straight Line-2

different form of St line

A) General form of St. line.

$L: ax+by+c=0$

① $x-2y+7=0$
$-2y+7=0$
$x+7=0$

$\left.\right\}$ all 3 are S line

① $x-2y+7=0$ Slope?

$$\text{Slope} = -\frac{(\text{coff of } x)}{\text{Coff of } y} = -\frac{1}{(-2)} = \frac{1}{2}$$

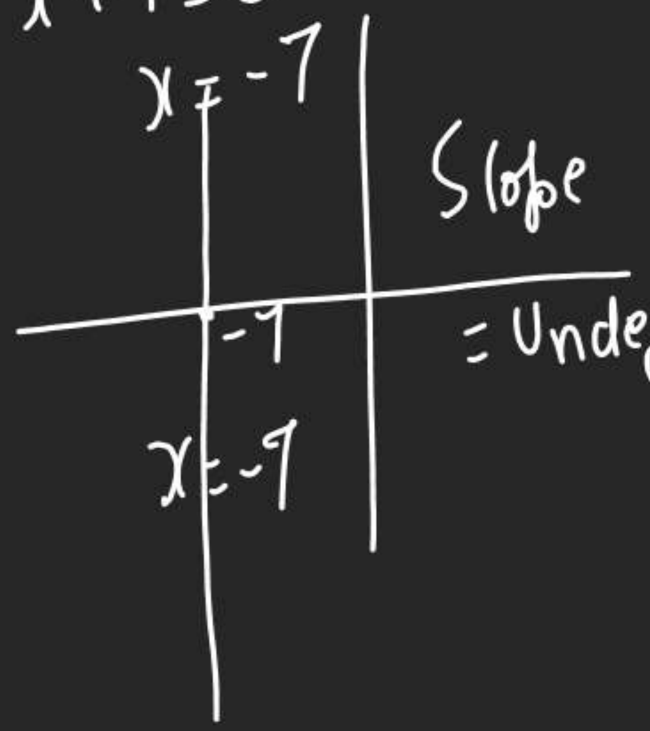
② $-2y+7=0$

$$y = \frac{7}{2}$$

Slope $=0$

③ $x+7=0$

$x=-7$

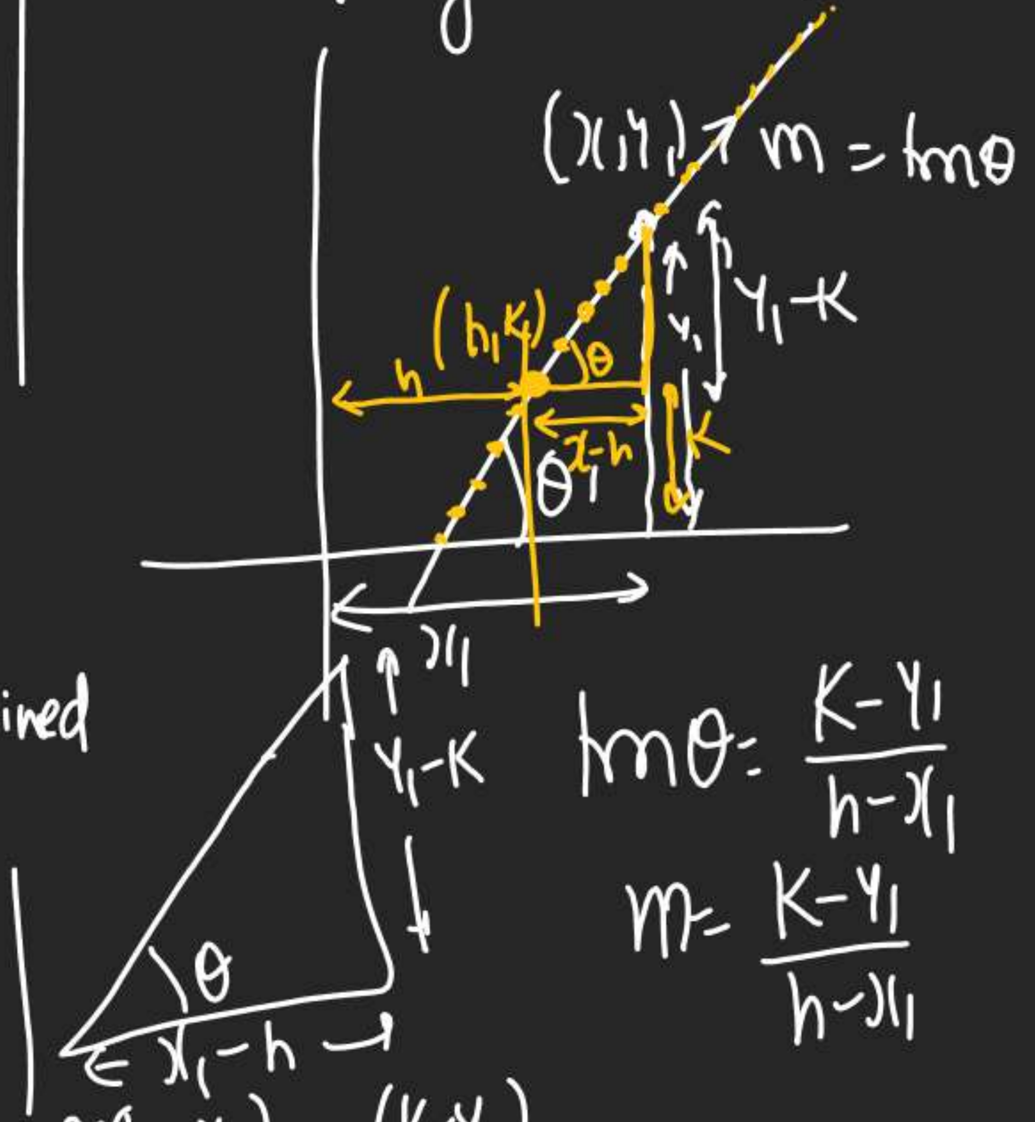


Slope = Undefined

(B) Slope pt. form

$$\boxed{(y-y_1)=m(x-x_1)}$$

here we have slope & a pt given in Qs.



$$\tan\theta = \frac{k-y_1}{h-x_1}$$

$$m = \frac{k-y_1}{h-x_1}$$

$$m(h-x_1) = (k-y_1)$$

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Q Find EOL

having Inclination 30°

from +ve x Axis & P.T. (1, −2)

$\theta = 30^\circ \Rightarrow m = \tan 30^\circ = \frac{1}{\sqrt{3}}$.

$(x_1, y_1) = (1, -2)$

$\therefore$ EOL $\Rightarrow y - y_1 = m(x - x_1)$

$y - (-2) = \frac{1}{\sqrt{3}}(x - 1)$

$\boxed{\sqrt{3}(y+2) = x - 1}$

Q Find EOL

Bisecting Line Segment

Joining (5, 3) & (4, 4)

& making angle 45° x Axis.