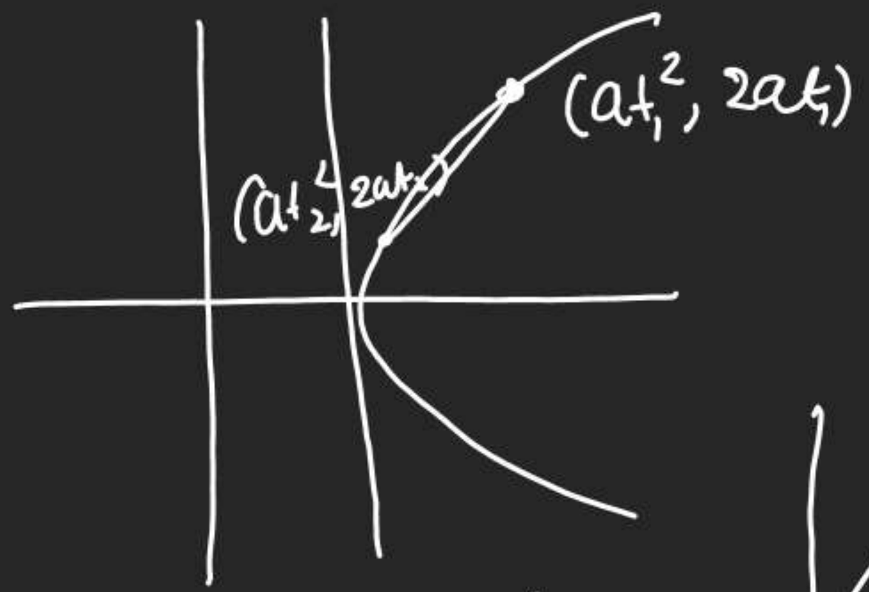
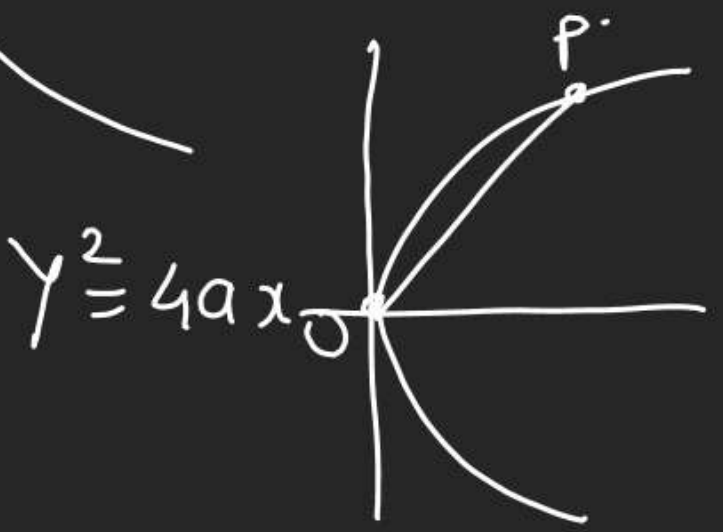
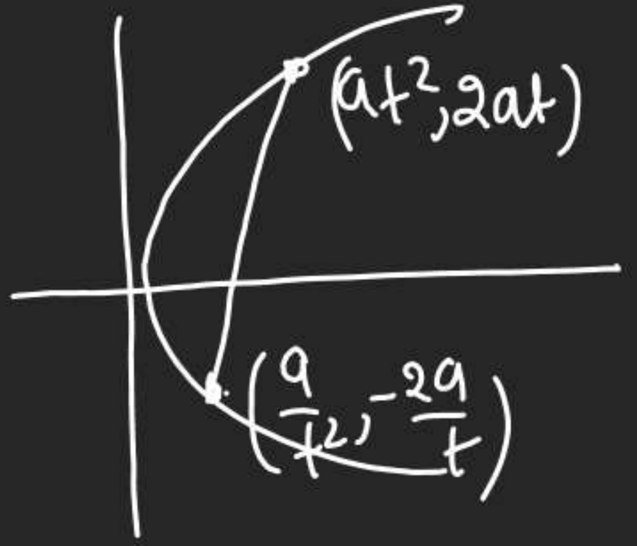
Nishant Jindal







$t_2 = -\frac{1}{t_1}$

$-1 = \frac{4}{t_1 t_2} = \boxed{\frac{2}{t_1}} \times \frac{2}{t_2}$

$-1 = m_{OP} \times m_{OQ}$

$\Rightarrow OP \perp OQ$

if Chord P.T. $(4a, 0)$

Chord.

$$\boxed{2x - y(t_1+t_2) + 2at_1t_2 = 0}$$

$(Sl) = \frac{2}{t_1+t_2}$

$(Sl)_0 = \frac{2}{t_1}$

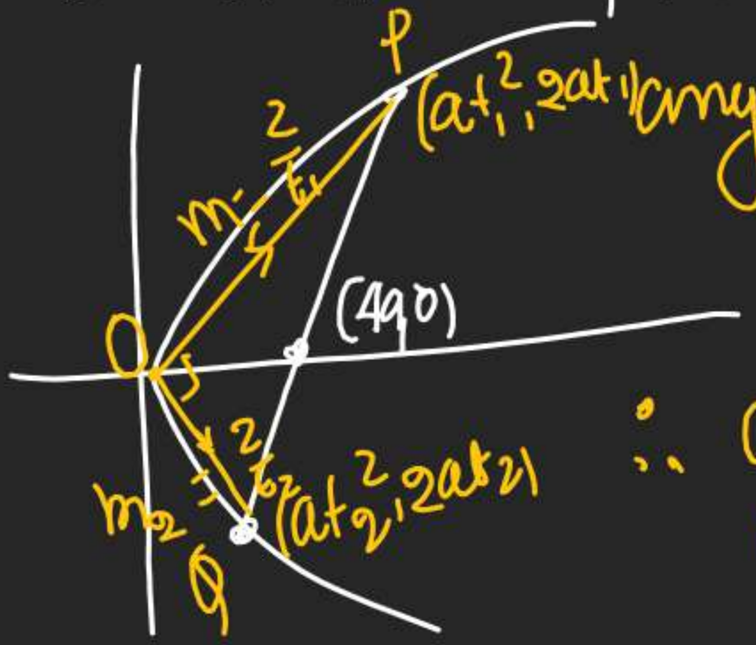
$(c, 0)$

$t_1 t_2 = -\frac{c}{a}$

$(a, 0) \rightarrow$ Focal

$t_1 t_2 = -\frac{a}{a} = -1$

Q P.T. all chords of $y^2 = 4ax$ which subtends rt. angle at vertex P.T. fixed Pt $(4a, 0)$



any chord P.T. $(c, 0)$ gives $t_1 t_2 = -\frac{c}{a}$

$\therefore$ chord P.T. $(4a, 0)$ will give $t_1 t_2 = -\frac{4a}{a}$

$t_1 t_2 = -4$

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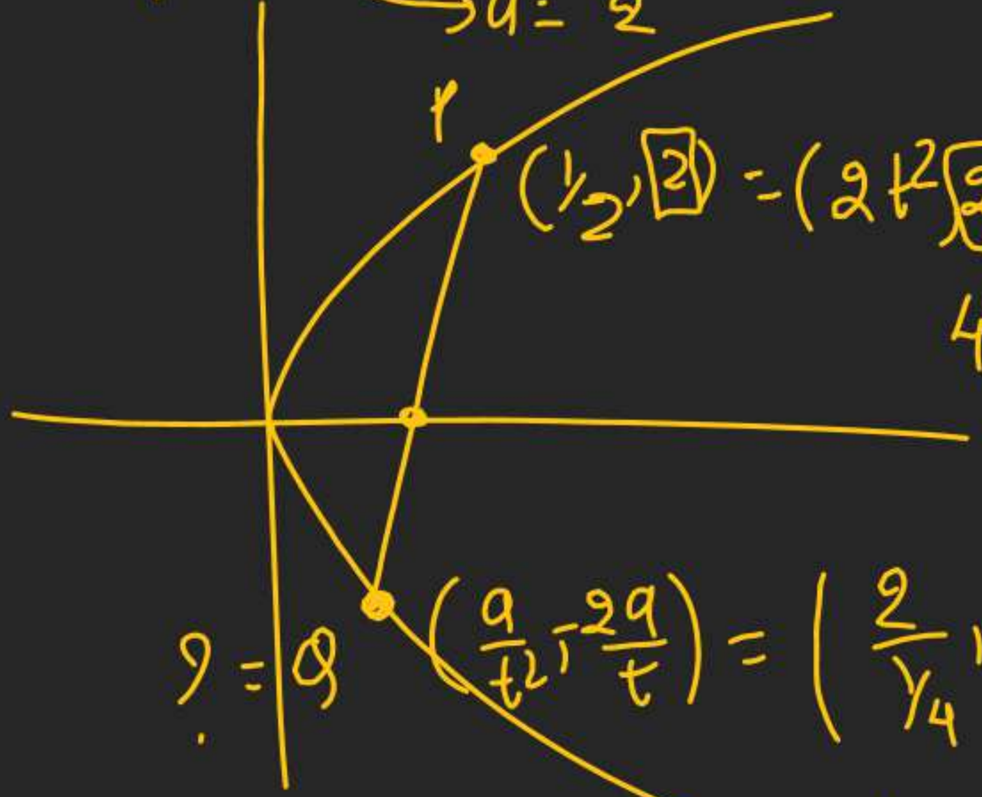
Q Other extremities of Focal chord of $y^2 = 8x$ which is drawn at $(\frac{1}{2}, 2)$ is

$\to a = 2$



$(\frac{1}{2}, \boxed{2}) = (2t^2, \boxed{2\times 2t})$

$4t = 2$

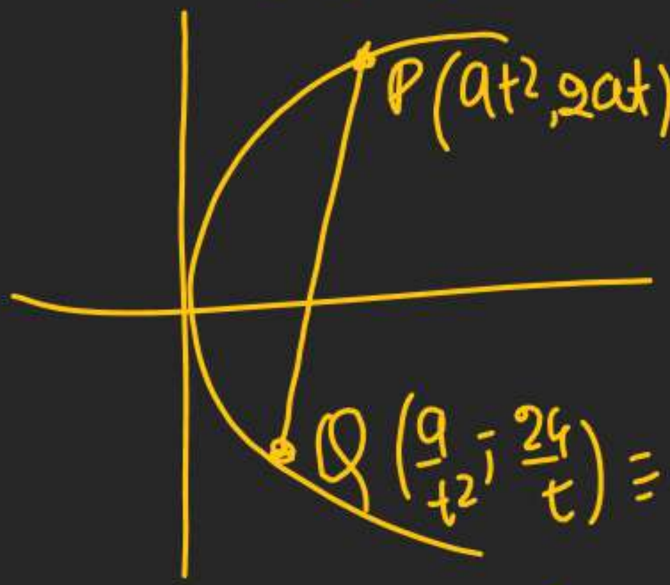
$t = \frac{1}{2}$

$Q = Q\left(\frac{a}{t^2}, \frac{-2a}{t}\right) = \left(\frac{2}{\frac{1}{4}}, \frac{-2\times 2}{\frac{1}{2}}\right)$

$= (8, -8)$

So Q will be $(8, -8)$

Q If $(x_1, y_1)(x_2 y_2)$ are extremities of Focal chord $y^2 = 4ax$ then $x_1 x_2 = ?$



$P(at^2, 2at) \equiv (x_1, y_1)$

$Q\left(\frac{a}{t^2}, \frac{-2a}{t}\right) \equiv (x_2 y_2)$

$x_1 = at^2, x_2 = \frac{a}{t^2}$

$x_1 x_2 = a^2$

Q Consider 2 Curves

$C_1: y^2 = 4x$

$C_2: x^2 + y^2 - 6x + 1 = 0$

then WOTF is true.

A) $C_1 C_2$ touches at 1 pt

B) C_2, C_2 touches at 2 pts

C) $C_1 C_2$ Intersect at 2 pts

D) $C_1 C_2$ Niether Intersect Nor touch.

Combine Eqn

$x^2 + 4x - 6x + 1 = 0$

$x^2 - 2x + 1 = 0 \Rightarrow (x-1)^2 = 0$

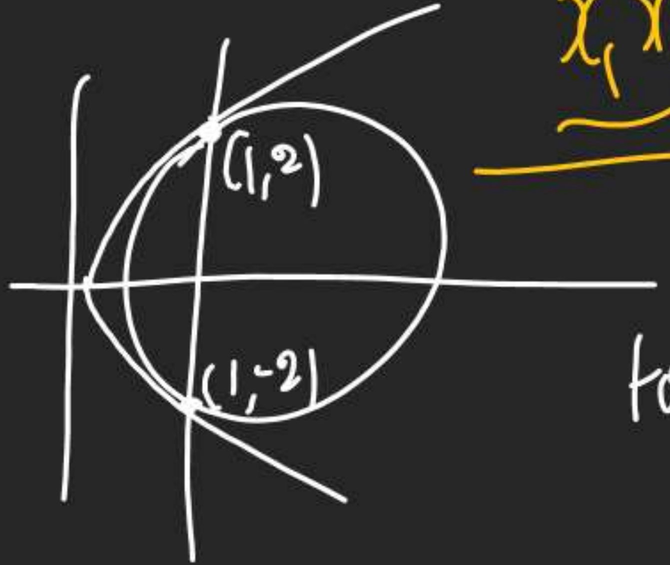
$\boxed{D = 0}$

touching at 2 pts

$x = 1, 1 \to C_1 \Rightarrow y^2 = 4$

$y = 2, -2$

$(1, 2)$ & $(1, -2)$



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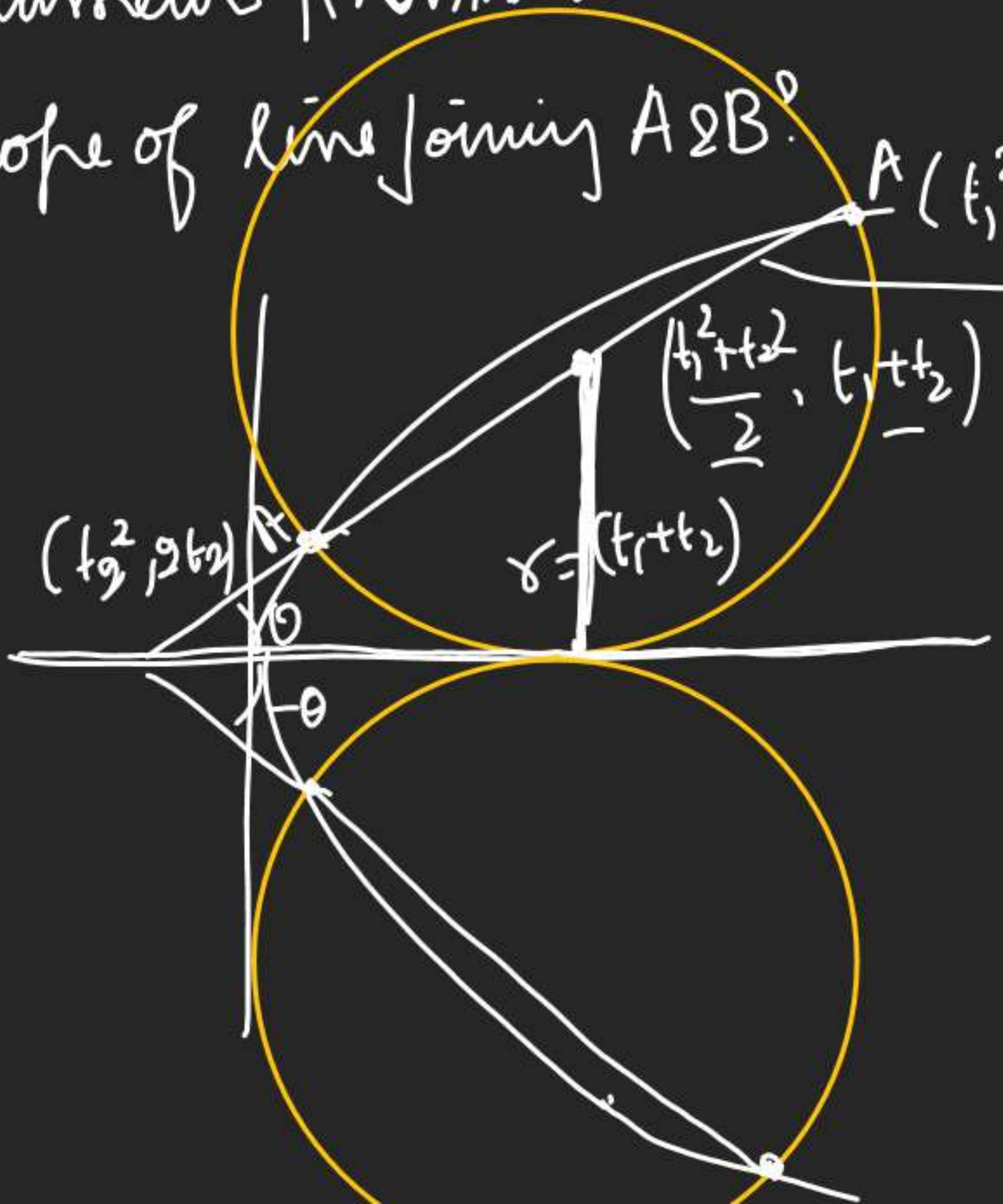
Q A & B are 2 pts on $y^2 = 4x$ ($a = 1$). If Axis of Parabola touches a circle of Radius r having AB as diameter, then what is the Slope of line joining A & B?

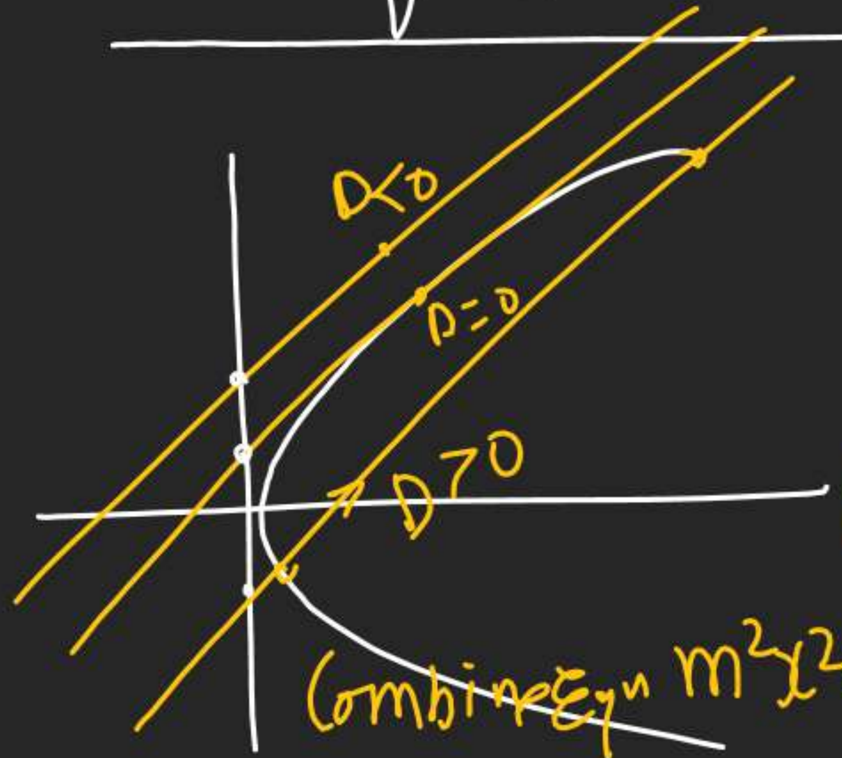


AB = Chord

$= 1 \quad (Sl)_{AB} = \dfrac{2}{t_1+t_2}$

$= \pm \dfrac{2}{r}$

Position of Line WRT. Parabola



Line → $y = mx + c$

Parabola ⇒ $y^2 = 4ax$

$(mx+c)^2 = 4ax$

Combine Eqn $m^2x^2 + (2mc - 4a)x + c^2 = 0$

↳ Q Eq in x

Line Cut	Line touches	Neither Cut Nor touch
$D>0$	$D=0$	$D<0$
$a - mc > 0$	$(2mc-4a)^2 - 4m^2c^2 = 0$	$c > \frac{a}{m}$
$a > mc$	$\cancel{4m^2c^2} - 16amc + 16a^2 - \cancel{4m^2c^2} = 0$	
$c < \frac{a}{m}$	$-mc + a = 0$	
	$a = mc \Rightarrow \boxed{c = \frac{a}{m}}$ → Cond^n of tangency	

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Q STL $y = 2x + \lambda$ does not meet Parabola $y^2 = 2x$ if $\Rightarrow a = 1/2$, $\lambda = 1$

$\lambda < \frac{1}{4}$ $\quad \lambda = 4$ $\quad \lambda > \frac{1}{4}$

$c > \frac{a}{m}$

$\lambda > \frac{1/2}{2}$

$\lambda > \frac{1}{4}$

Q If $y = 4x + c$ is tangent to $y^2 = 16x$ find value of c.

$m = 4 \mid a = 4$

$c = \frac{a}{m}$

$= \frac{4}{4} = 1$

Q Find Slope of Focal Chord for $y^2 = 4ax$.

$t - \frac{1}{t} = \frac{2}{\tan\theta}$ $\quad m = \frac{2}{t + -\frac{1}{t}} = \frac{2t}{t^2 - 1}$

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

Q Length of focal chord for $y^2 = 4ax$.

$L_{FC} = a\left(t + \frac{1}{t}\right)^2$

$= a\left\{\left(t - \frac{1}{t}\right)^2 + 4\right\}$

$= a\left\{(2\cot\theta)^2 + 4\right\}$

$\boxed{L_{FC} = 4a\,\mathrm{cosec}^2\theta}$

Q Min Length of FC?

$(\mathrm{cosec}^2\theta)_{Min} = 1$

$\therefore L_{FC\,Min} = 4a = LLR$

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Eqn of Tangent

Slope form

When given Point is outside Parabola

$c = \frac{a}{m}$

$\therefore$ EOT $\boxed{y = mx + \frac{a}{m}}$

Cart. form $(T = 0)$

जब (x_1, y_1) Parabola पर हो

Curve $y^2 = 4ax$

$y^2 = 2ax2x$

$\boxed{yy_1 = 2a(x + x_1)}$

EOT

Par. form

When you Suppose Par Coord $(at^2, 2at)$

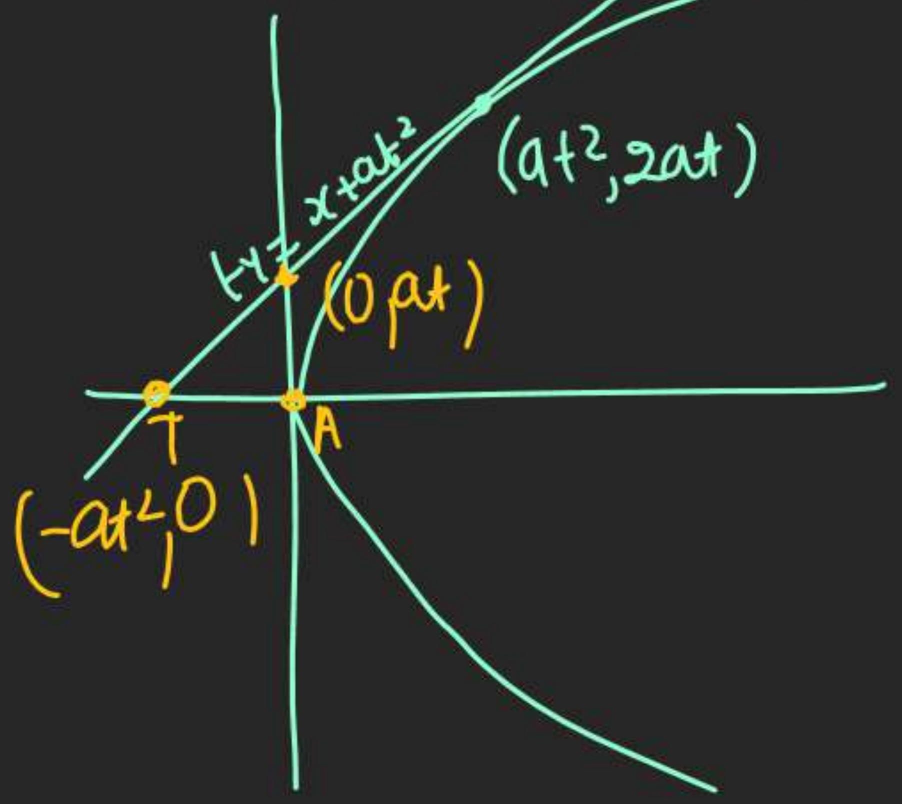
$at^2 \to x_1$, $2at \to y_1$

$y \cdot 2at = 2a(x + at^2)$

$\boxed{ty = x + at^2}$

EOT

Now forward........



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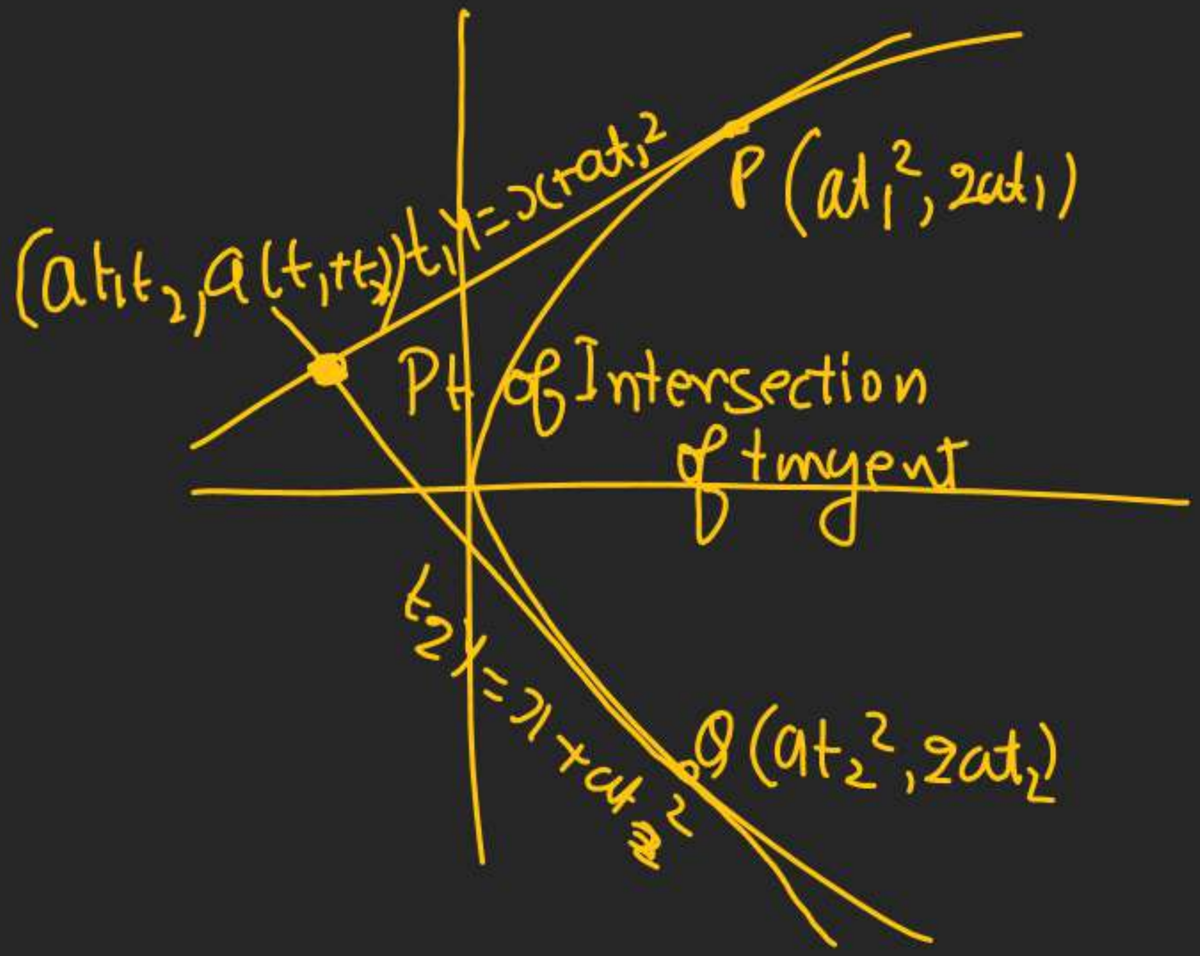

$$t_1 y = x + a t_1^2$$
$$t_2 y = x + a t_2^2$$
$$y(t_1 - t_2) = a(t_1^2 - t_2^2)$$
$$y = a(t_2 + t_1)$$
$$a t_1 (t_2 + t_1) = x + a t_1^2$$
$$a t_1 t_2 + \cancel{a t_1^2} = x + \cancel{a t_1^2}$$