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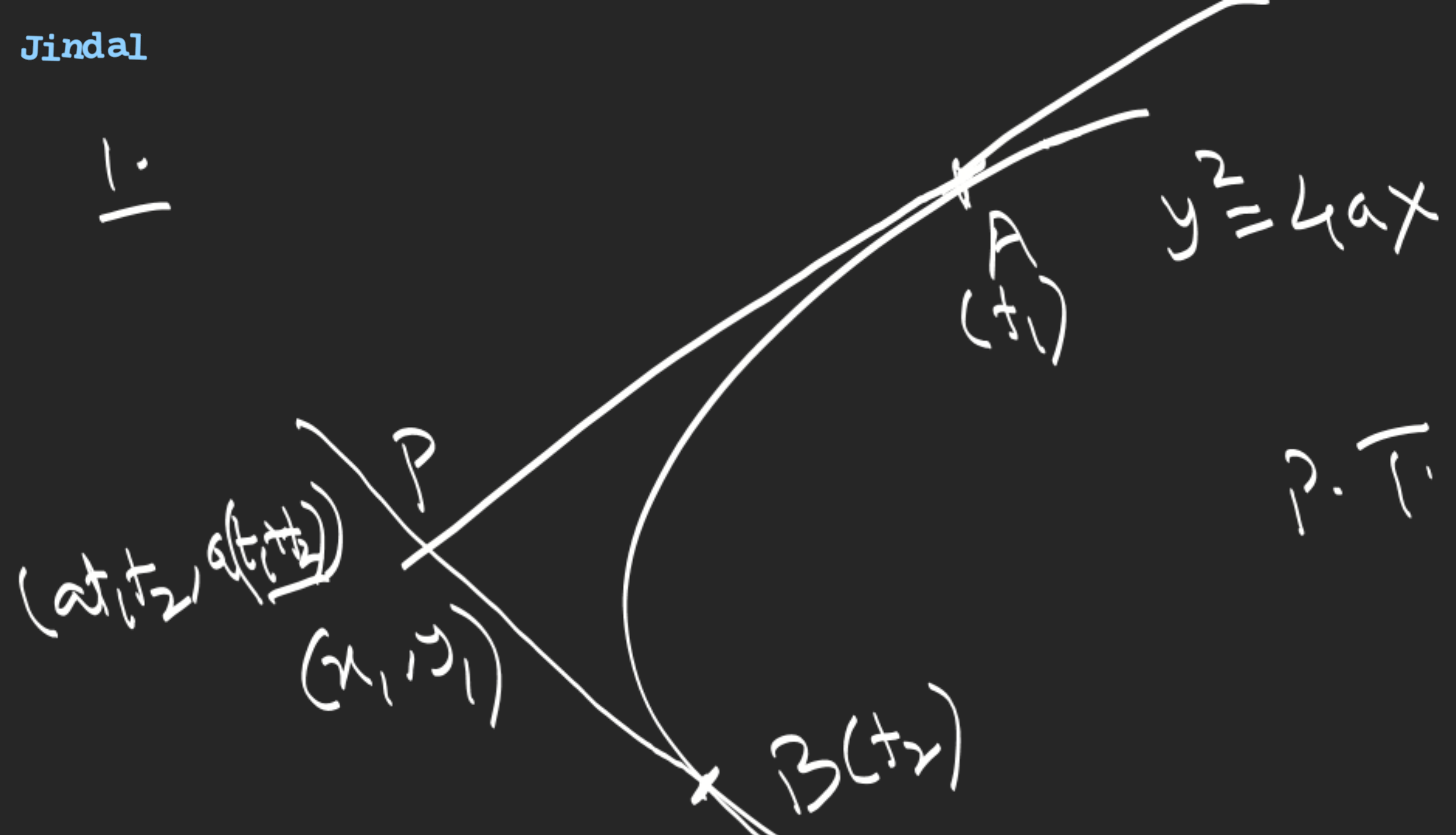
1.



P.T. area of ΔPAB

$$= \left| \frac{(y_1^2 - 4ax_1)^{3/2}}{2a} \right|$$

$$\frac{a^2}{2} \begin{vmatrix} t_1^2 & 2t_1 & 1 \\ t_1t_2 & t_1+t_2 & 1 \\ t_2^2 & 2t_2 & 1 \end{vmatrix} = (t_2-t_1)^2 \frac{a^2}{2} \begin{vmatrix} t_1^2 & 2t_1 & 1 \\ t_1 & 1 & 0 \\ t_2 & 1 & 0 \end{vmatrix} = (t_2-t_1)^3 \frac{a^2}{2}$$

$$= \frac{a^2}{2} \left((t_1+t_2)^2 - 4t_1t_2 \right)^{3/2}$$

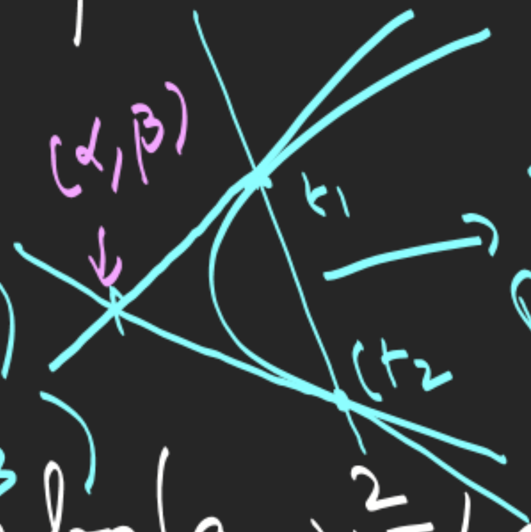
$$= \frac{a^2}{2} \left(\left(\frac{y_1}{a}\right)^2 - \frac{4x_1}{a} \right)^{3/2}$$

2. Line $3x+y=6$ intersects the parabola $y^2=4x$ at A & B. Find coordinates of point of intersection of tangents drawn at A & B.

$y\beta - 2x = 2\alpha$ — ①

$\boxed{\frac{-2}{3} = \beta = \frac{2\alpha}{6}}$

$y\beta - 2(x+\alpha) = 0$



$3x+y=6$ — ②

Put $(t^2, 2t)$

$3t^2+2t-6=0 < {t_1 \atop t_2}$

$(t_1t_2,\ t_1+t_2) = (-2,\ -2/3)$

3. From the point where any normal to parabola $y^2=4ax$ meet the axis is drawn a line $\perp$ar to this normal. P.T. this line always touches an equal parabola.

$y = \frac{1}{t}(x-2a-at^2)$

$(2a+at^2, 0)$

$y+tx = 2at+at^3$

$at^2 + ty - (x-2a) = 0$

$D=0 \Rightarrow \boxed{y^2 + 4a(x-2a) = 0}$

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4. Find the locus of middle point of the chords of parabola $y^2=4ax$ which

(i) are normal to it

(ii) subtend a constant angle 'α' at vertex.

(iii) are of given length $2l$

(iv) are n.t. normals at their extremeties meet on same parabola

$yk-2a(x+h)=k^2-4ah$

$$\boxed{yk-2ax=k^2-2ah}$$

$(k^2-2ah)y^2-4ax(yk-2ax)=0$

$k(2at)-2a^2t^2=k^2-2ah$

$$\boxed{2a^2t^2-2kat+k^2-2ah=0 \begin{matrix} t_1 \\ t_2 \end{matrix}}$$

$t_2=-t_1-\frac{2}{t_1} \Rightarrow -\frac{2}{t_1}=\frac{k}{a}$

$$\boxed{t_1=-\frac{2a}{k}}$$

$2a^2\left(\frac{4a^2}{k^2}\right)-2ak\left(\frac{-2a}{k}\right)+k^2-2ah=0$

$t_1t_2=2$

$\frac{k^2-2ah}{2a^2}=2$

$\tan\alpha=\frac{\frac{2}{t_1}-\frac{2}{t_2}}{1+\frac{4}{t_1t_2}} \Rightarrow (t_1t_2+4)^2\tan^2\alpha=4\left((t_1+t_2)^2-4t_1t_2\right)$

(h,k)

$4a(h+r\cos\theta)=(k+r\sin\theta)^2$

$r^2\sin^2\theta+(2k\sin\theta-4a\cos\theta)r+k^2-4ah=0$

l, $-l$

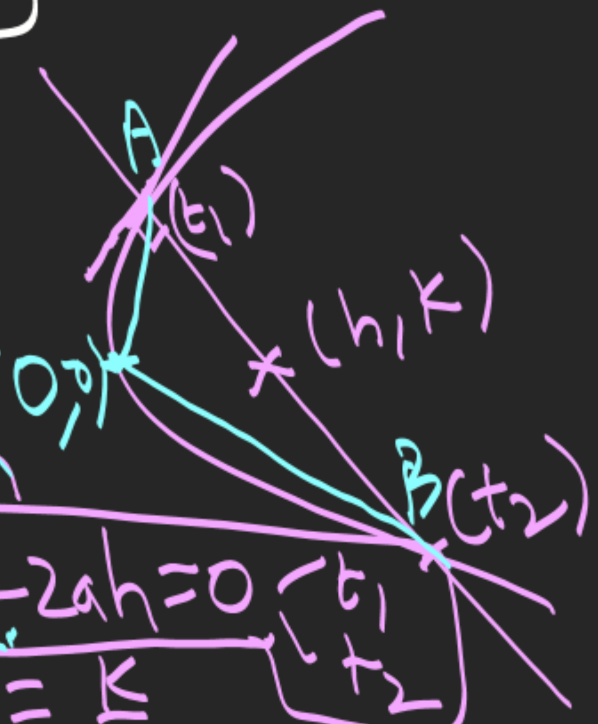
$$\boxed{\tan\theta=\frac{2a}{k}}$$

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

$4l^2=a^2(t_1^2-t_2^2)^2+4a^2(t_1-t_2)^2=a^2\left((t_1+t_2)^2-4t_1t_2\right)\left((t_1+t_2)^2+4\right)$

remaining DE

Prob → Ex-I (1-15)



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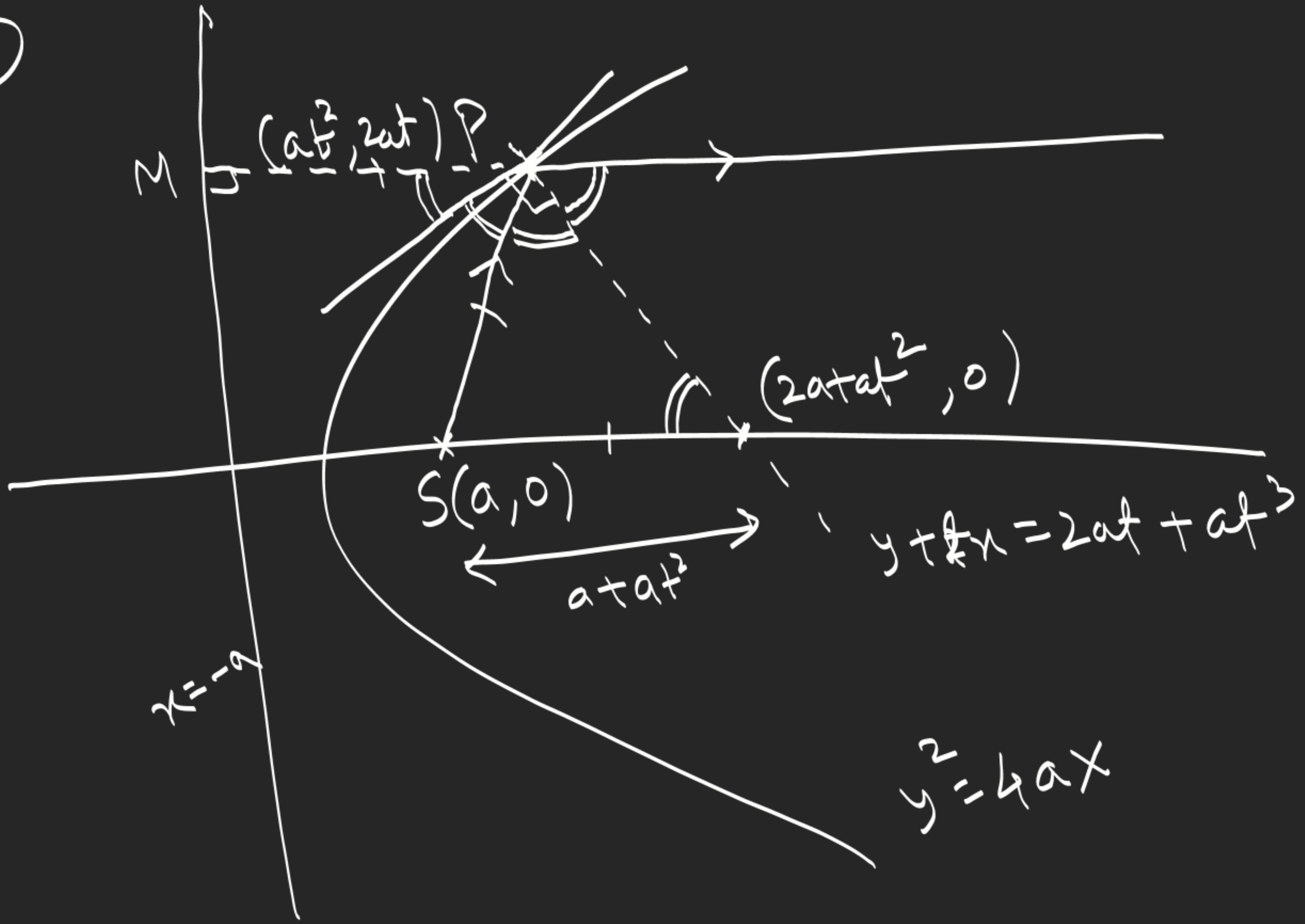
Note → 1



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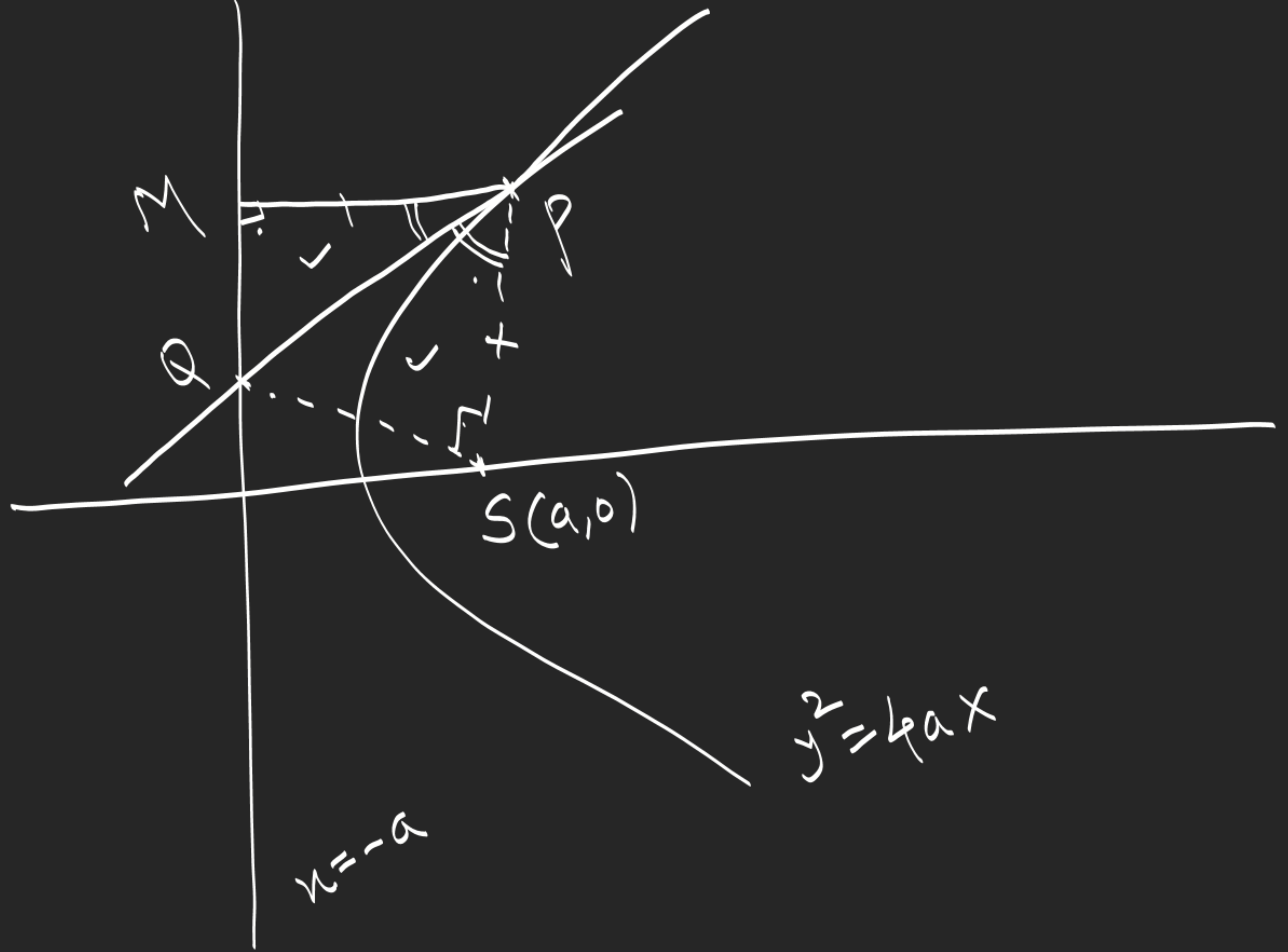

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