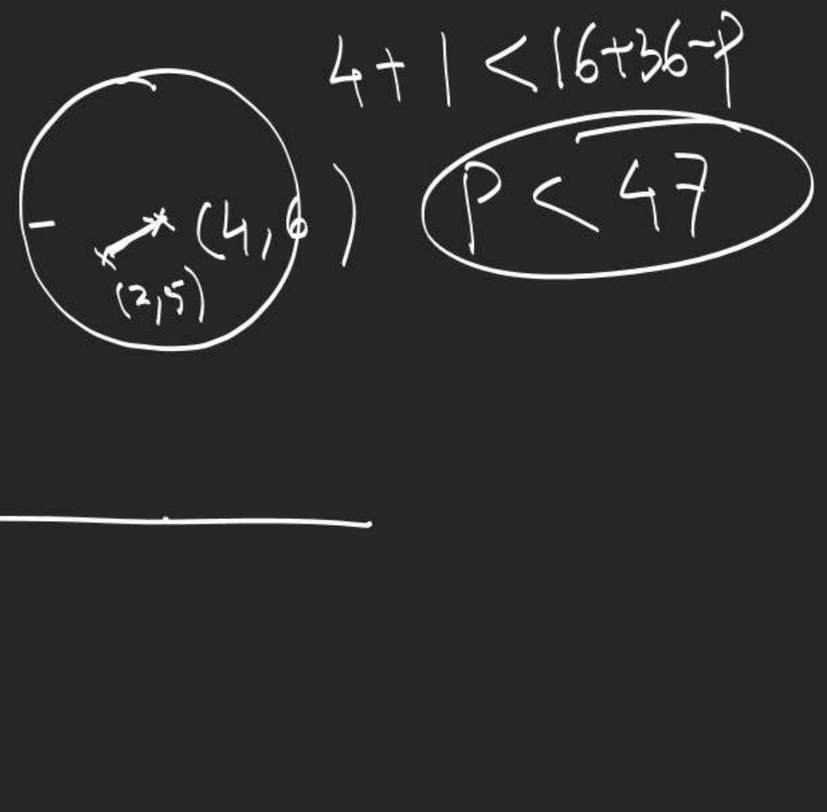
Nishant Jindal

1. Find 'p' for which power of point $P(2,5)$ is negative w.r.t. a circle $x^2+y^2-8x-12y+p=0$ and the circle neither touches nor intersects the coordinate axes.



$4+1 < 16+36-p$

$p < 47$

$S_1 < 0 \Rightarrow p < 47$ ✓

$p \in (36, 47)$

$g^2 - c < 0$

$f^2 - c < 0$

$S_1 < 0$

$\Rightarrow 16+36-p < 16$ ($r < 4$ ✓)

$p > 36$

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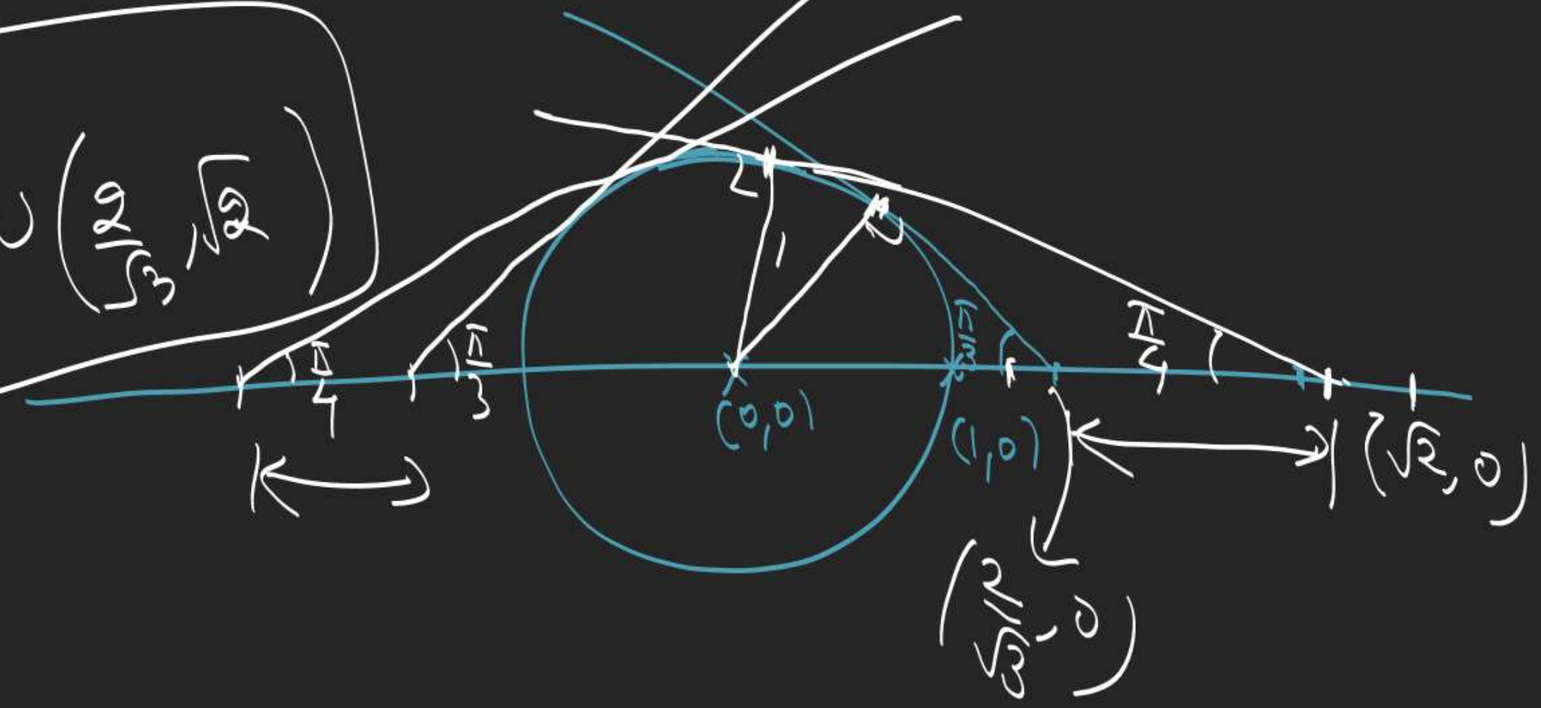
2. Find 'a' for angle θ between the pair of tangents drawn from point $(a,0)$ to the circle $x^2+y^2=1$ satisfies $\frac{\pi}{2} < \theta < \frac{2\pi}{3}$.

$$a \in \left(-\sqrt{2}, -\frac{2}{\sqrt{3}}\right) \cup \left(\frac{2}{\sqrt{3}}, \sqrt{2}\right)$$



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3. Find the eqn. to locus of middle point (h,k) of chords of circle $x^2+y^2+2gx+2fy+c=0$ which passes thru a fixed point (a,b).

$$xh+yk+g(x+h)+f(y+k)+c = h^2+k^2+2gh+2fk+c.$$

Put (a,b)

$$ah+bk+g(a+h)+f(b+k)+c = h^2+k^2+2gh+2fk+c.$$

$$(h-a)(h+g)+(k-b)(k+f)=0$$

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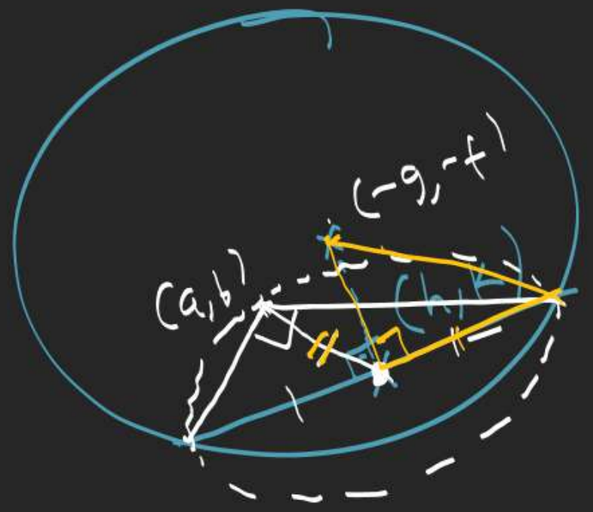
4. Find the eqn. to locus of middle point of chord of the circle $x^2+y^2+2gx+2fy+c=0$ which subtends a right angle at a given point $P(a,b)$



$$g^2+f^2-c = (h+g)^2+(k+f)^2 + (h-a)^2+(k-b)^2$$

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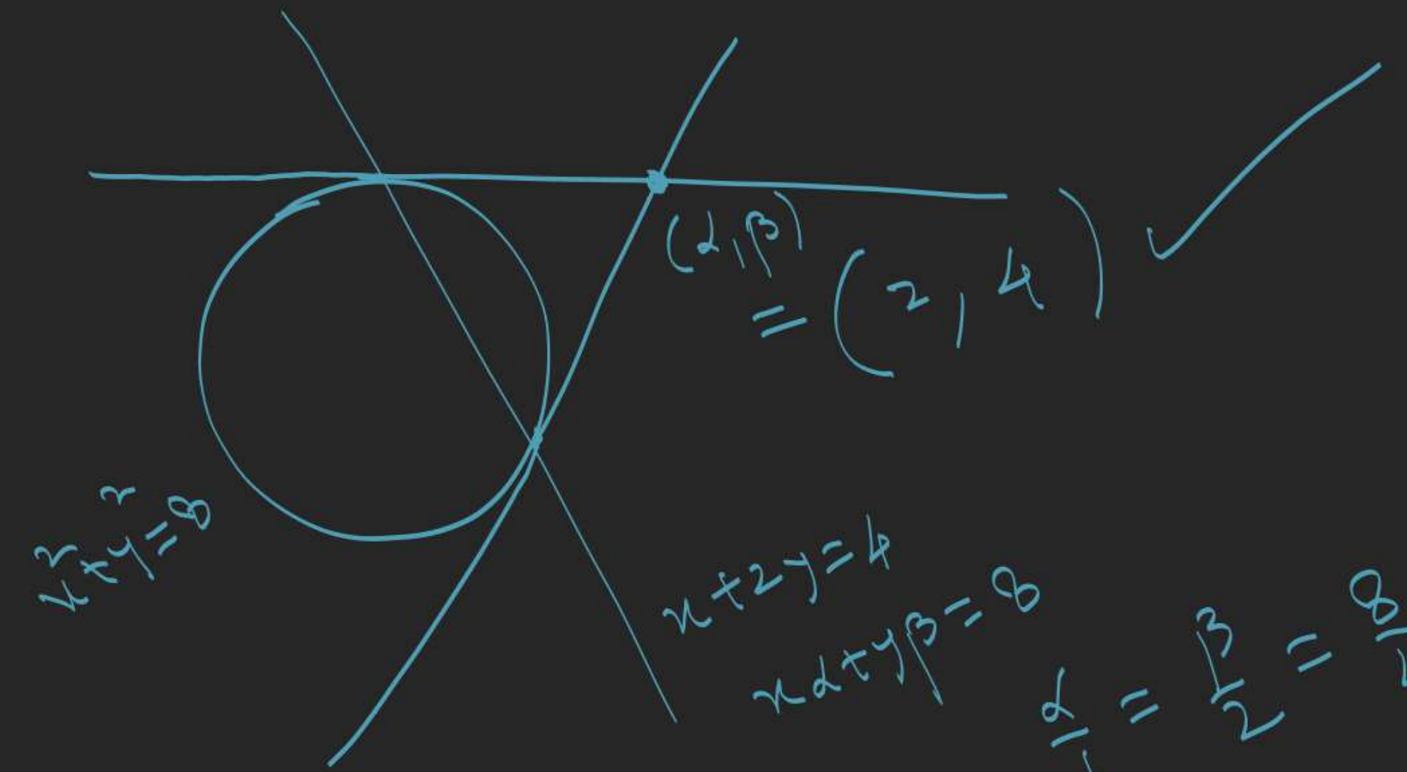
5. Tangents are drawn to circle $x^2+y^2=8$ at the points where the line $x+2y=4$ intersects the circle. Find the coordinates of point of intersection of tangents.



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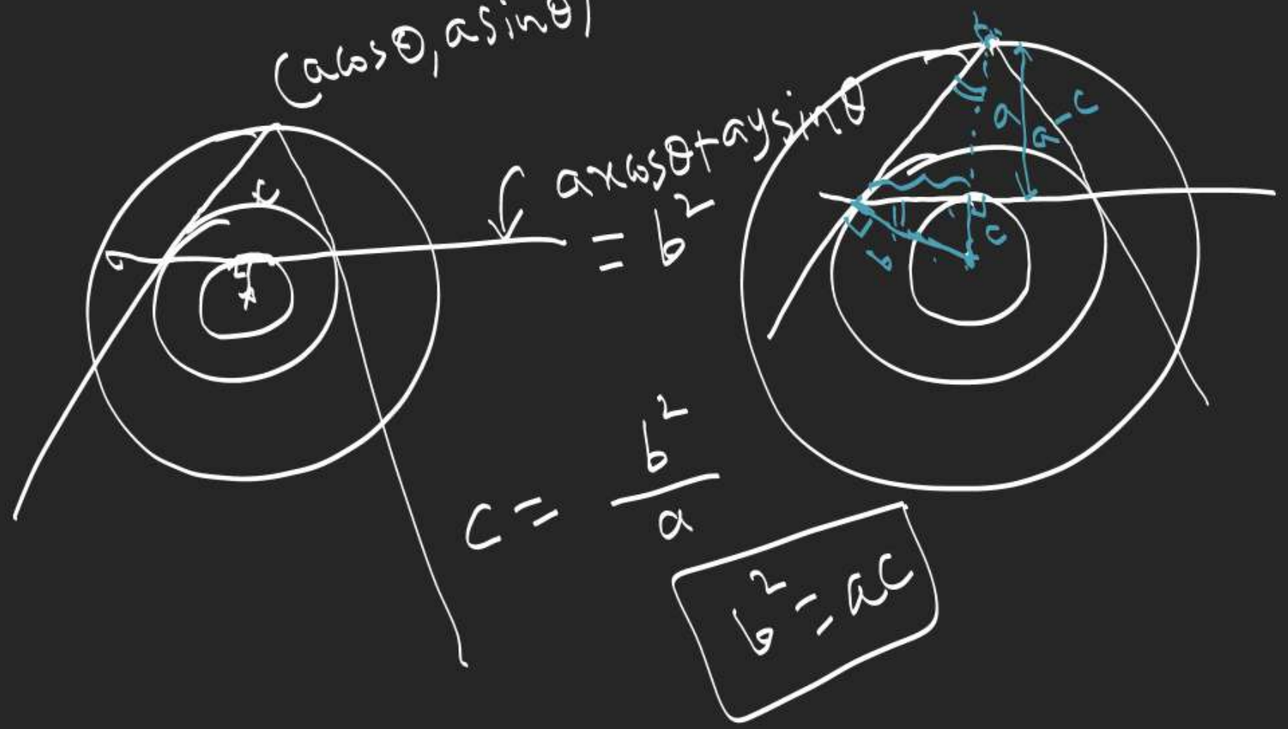
6. Chord of contact of tangents drawn from a point on the circle $x^2+y^2=a^2$ to the circle $x^2+y^2=b^2$ touches the circle $x^2+y^2=c^2$, $(a,b,c>0)$. P.T. a, b, c are in G.P.



$$c = \frac{b^2}{a}$$

$$b^2 = ac$$

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

$$b^2 = ac$$

P-2

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7: Find the eqn. to locus of feet of perpendicular drawn from origin upon a variable chord of the circle $x^2+y^2+2gx+2fy+c=0$ which subtends right angle at origin.