Q9 $x^2+y^2 - \dfrac{2Cx}{\sqrt{1+m^2}} - \dfrac{2Cmy}{\sqrt{1+m^2}} = 0$

$x^2+y^2+2gx+2fy+C=0$

$(center = (-g,-f))$

(8) $x^2+y^2-2gx+2fy=0$

$x^2+y^2+2gx+2fy+C=0$

Q13

$(1,-2)$

$(4,-3)$

$(-g,-f)$

$3x+4y=7$
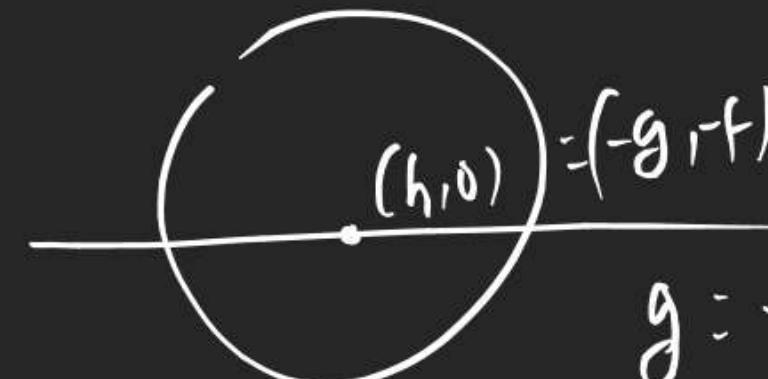
$-3g-4f-7=0$

$3g+4f+7=0 \rightarrow ①$

Q14

$(0,a)(b,0)$

$(h,0) = (-g,-f)$

$g=-h, f=0$

$b^2+2bg+0+C=0$

$g=$

$x^2+y^2+2gx+2fy+C=0$

$1+4+2g-4f+C=0$

$2g-4f+C+5=0$

$25+8g-6f+C=0$

$-6g+2f-20=0$

$3g-f+10=0$

$3g+4f+7=0$

(g,f)

$x^2+y^2+2gx+2fy+C=0$

$a^2+0+2af+C=0$

$2af=-C-a^2$

$f=-\dfrac{C-a^2}{2a}$

(a,b)

$(a,-b)$

$(a+b, a-b)$

$$x^2+y^2+2gx+2fy+c=0$$

(a,b)

$$a^2+b^2+2ag+2bf+c=0$$

$(a,-b)$

$$a^2+b^2+2ag-2bf+c=0$$

$$4bf=0 \quad f=0$$

$$(a+b)^2+(a-b)^2+2g(a+b)+c=0$$

$$2a^2+2b^2+2g(a+b)+c=0$$

$$2a^2+2b^2+4ag+c=0$$

$$f=0$$
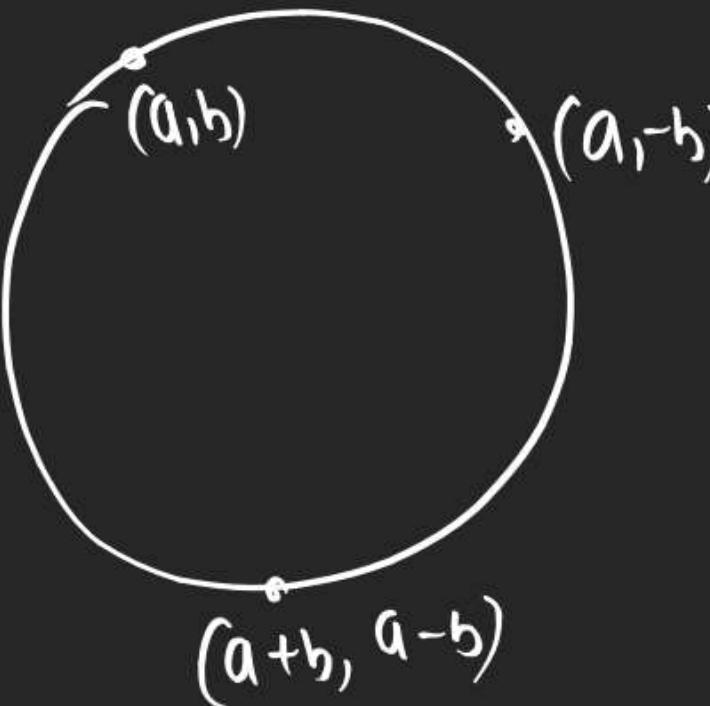
$$g(2a+2b-4a)=c$$

$$c=(2b-2a)g$$

$$a^2+b^2+2ag+(2b-2a)g=0$$

$$a^2+b^2+2bg=0$$

$$g=-\frac{(a^2+b^2)}{2b}$$

$$x^2+y^2-2\frac{(a^2+b^2)}{2b}x+2(b-a)x-\frac{(a^2+b^2)}{2b}=0$$

$$b(x^2+y^2)-2(a^2+b^2)x-2(b-a)(a^2+b^2)=0$$

1) $(x-a)^2 + (y-b)^2 = r^2$

2) $x^2 + y^2 + 2gx + 2fy + c = 0$

3) $ax^2 + by^2 + 2hxy + 2gx + 2fy + c = 0$

$$\Delta \neq 0 \;\bigg|\; a = b$$
$$h = 0$$

(4) dim $\rightarrow$ $(x-x_1)(x-x_2) + (y-y_1)(y-y_2) = 0$

$Q \in$ on $x^2 + Q \in$ on $y^2 = 0$

$PA \times PB = PC \times PD$

5)

$PA \times PB = \underline{PT^2}$

6)
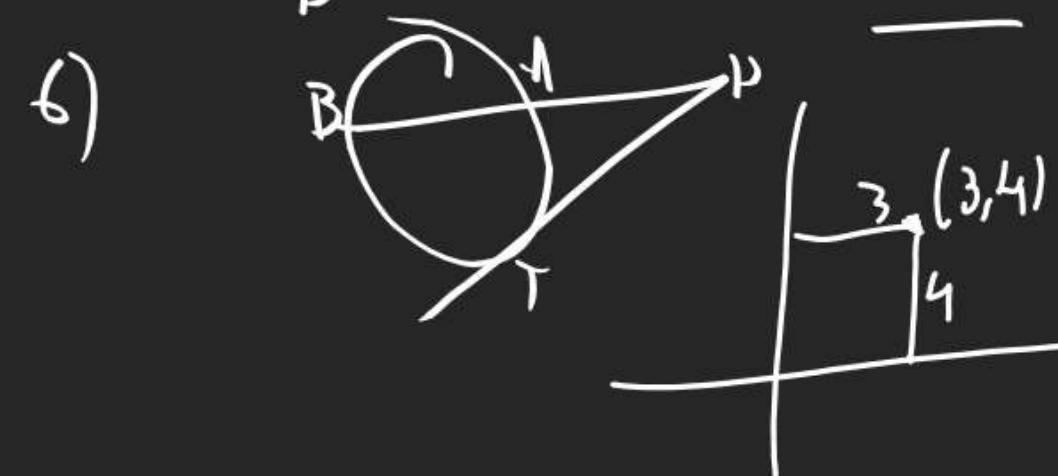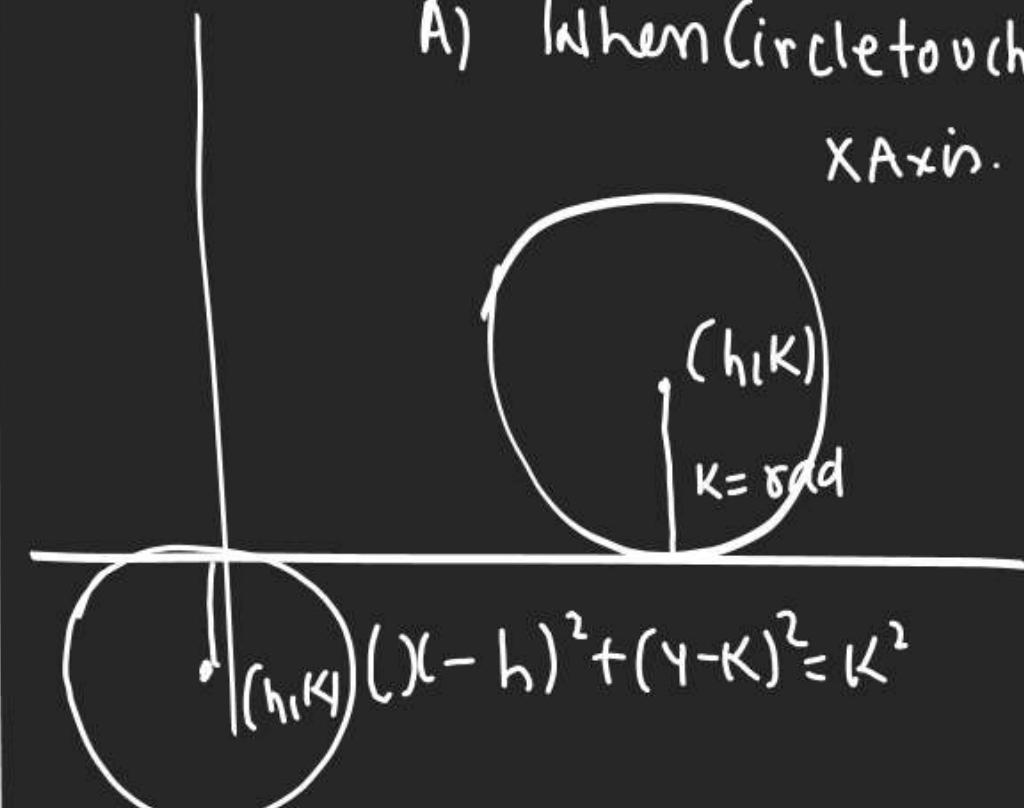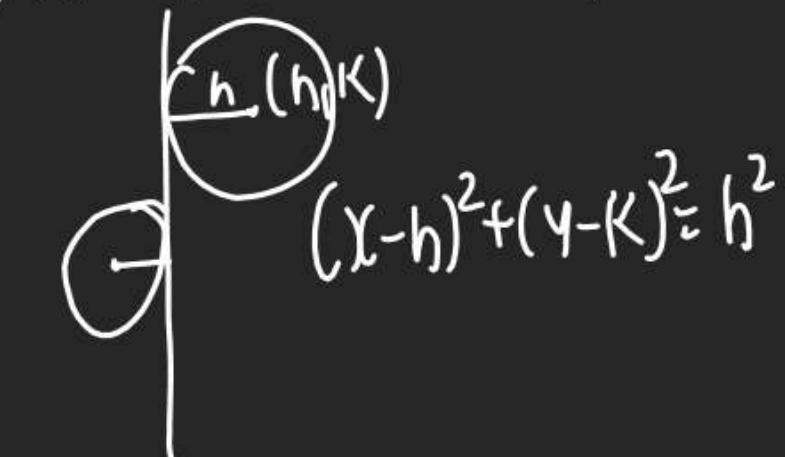
Different Situation of Circle.

around co-axes
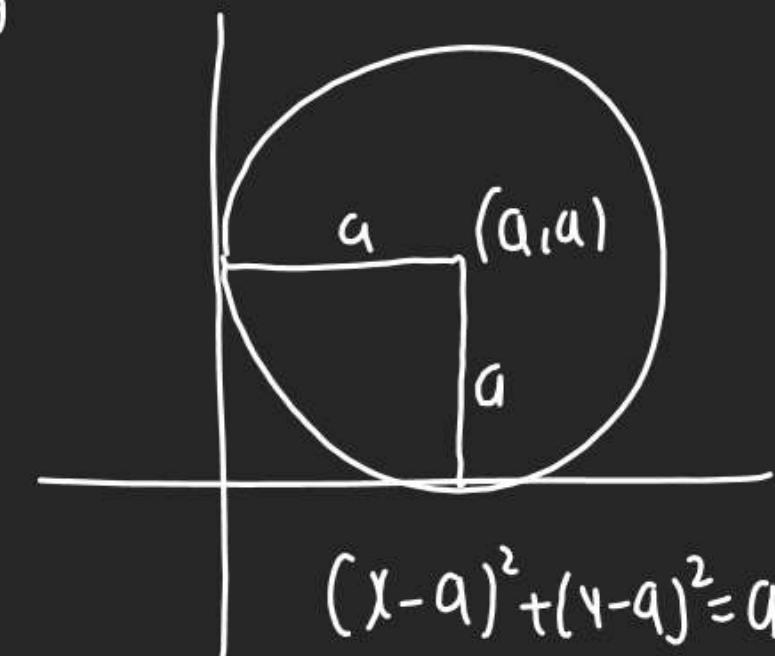
A) When Circle touches X Axis.

$k = rad$

$(x-h)^2 + (y-k)^2 = k^2$
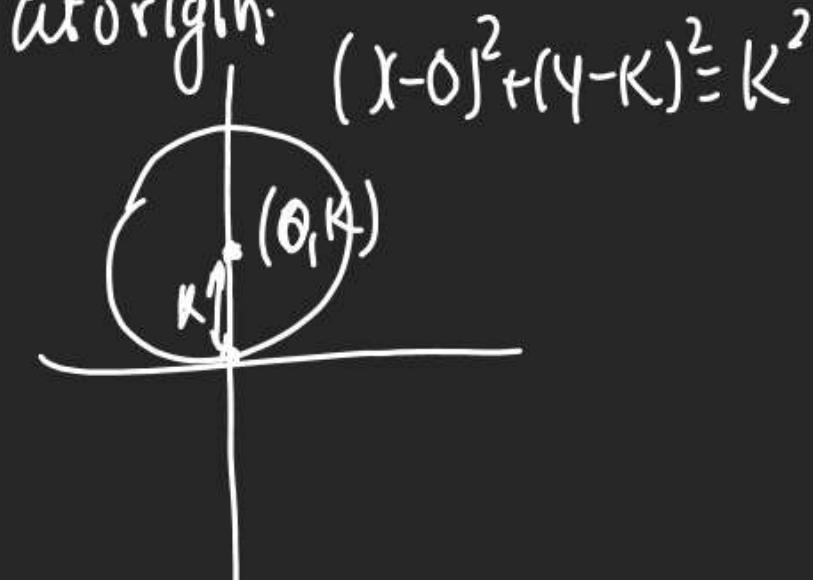
(B) When Circle touches y Axis

$(x-h)^2 + (y-k)^2 = h^2$
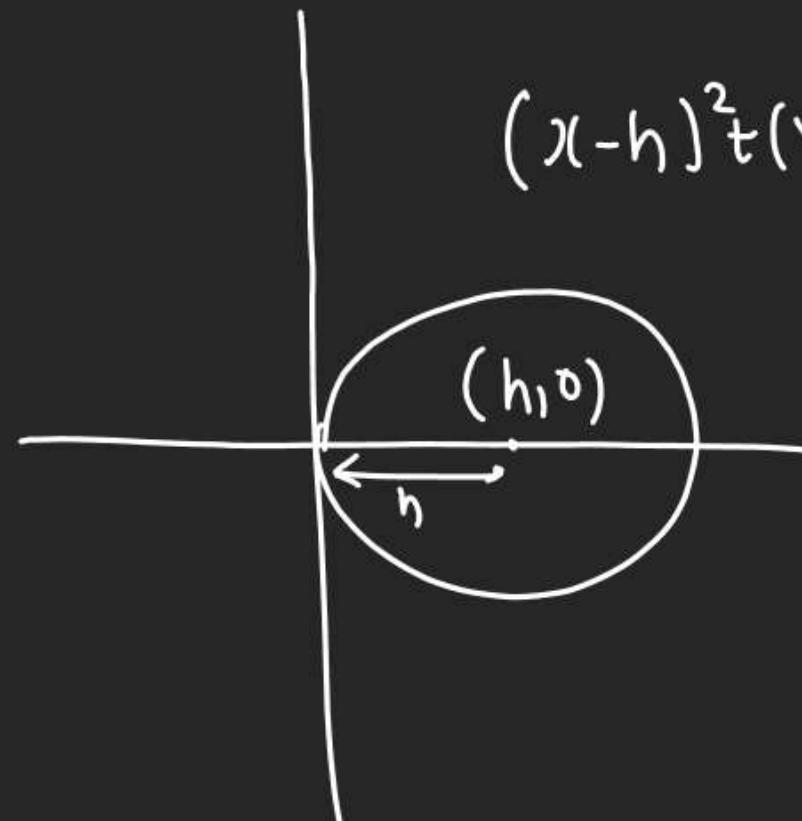
(C) When Circle touches Both axes.

$(x-a)^2 + (y-a)^2 = a^2$
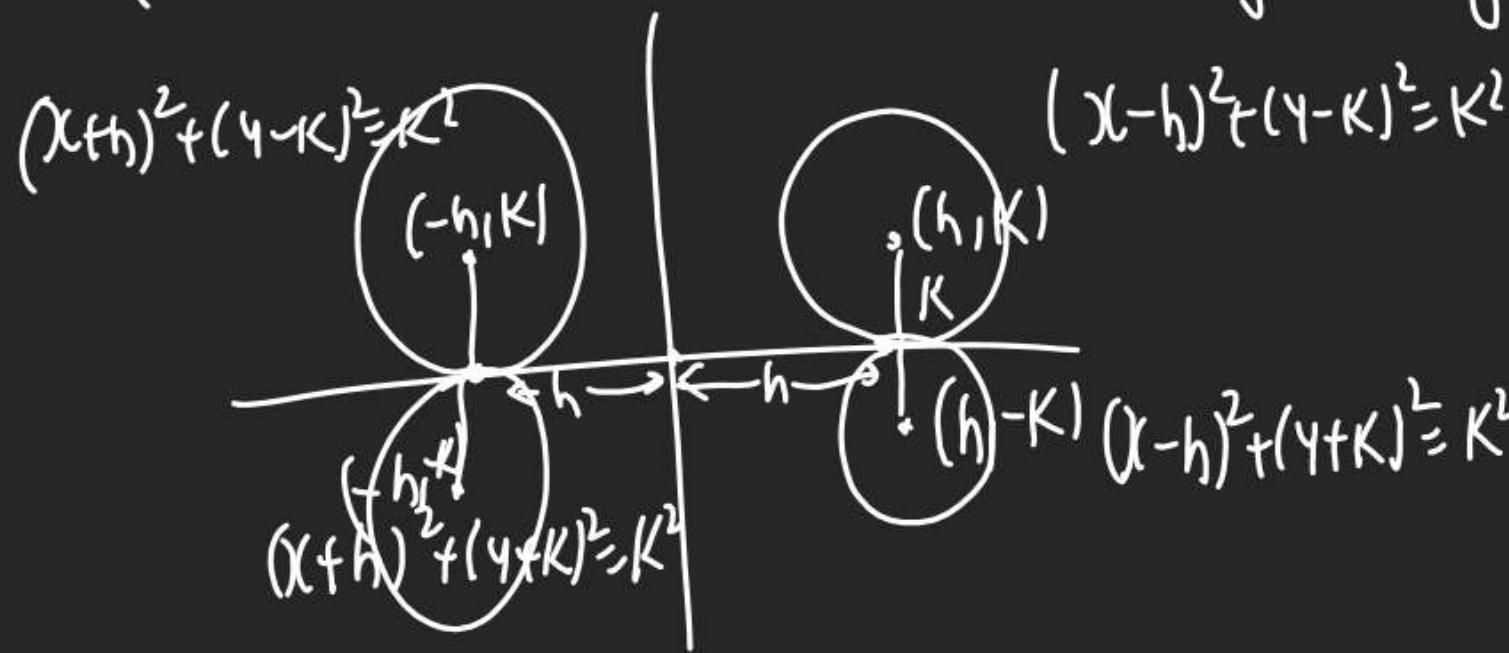
(D) When Circle touches X Axis at origin.

$(x-0)^2 + (y-k)^2 = k^2$

$(0,k)$
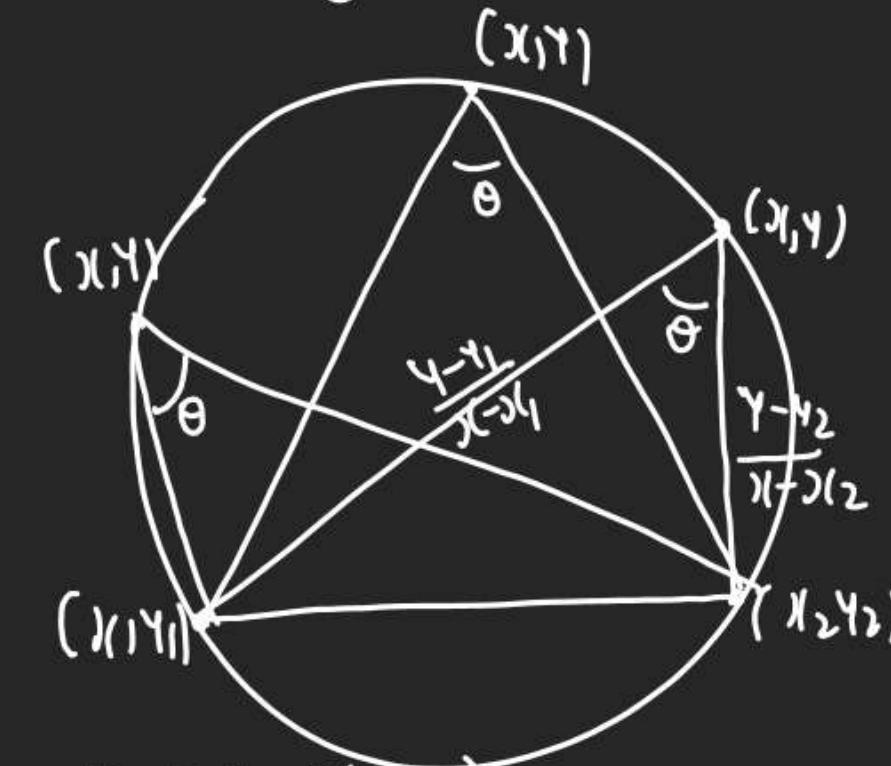
E) When Circle touches Origin at Y Axis

$$(x-h)^2 + (y-0)^2 = h^2$$

$(h, 0)$

h

(F) When Circle touches X Axis at h dist from origin.

$$(x+h)^2 + (y-k)^2 = k^2$$

$(-h, k)$

$$(x-h)^2 + (y-k)^2 = k^2$$

(h, k)

K

h h

$(-h, -k)$

$(h, -k)$

$$(x+h)^2 + (y+k)^2 = k^2$$

$$(x-h)^2 + (y+k)^2 = k^2$$

(G)   When a Chord with end Pt (x_1, y_1) & (x_2, y_2)

making θ angle at its Circumference

(x, y)

θ

(x_1, y_1)

(x, y)

θ

$\dfrac{y - y_1}{x - x_1}$

θ

$\dfrac{y - y_2}{x - x_2}$

(x_1, y_1)

(x_2, y_2)
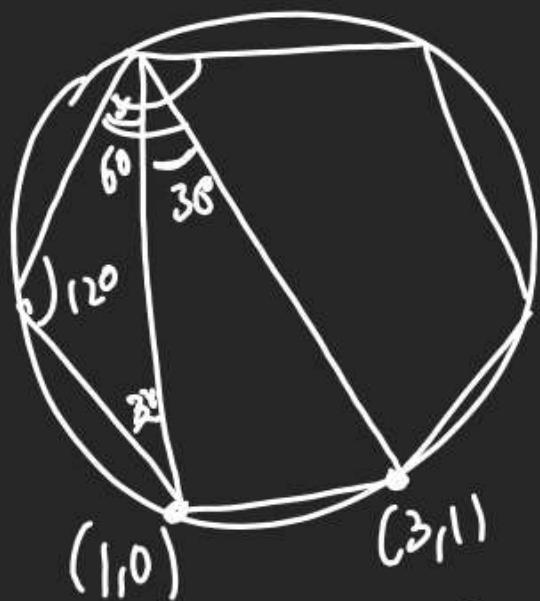
$$\frac{\left(\dfrac{y - y_1}{x - x_1}\right) - \left(\dfrac{y - y_2}{x - x_2}\right)}{1 + \left(\dfrac{y - y_1}{x - x_1}\right)\left(\dfrac{y - y_2}{x - x_2}\right)} = \pm \tan\theta$$

$$(x - x_1)(x - x_2) + (y - y_1)(y - y_2) = \pm \cot\theta \left\{ (y - y_1)(x - x_2) - (y - y_2)(x - x_1) \right\}$$

Q 2 Adjacent vertices of a Regular hexagon are $(1,0)$ & $(3,1)$ then EOC Circumscribed hexagon?
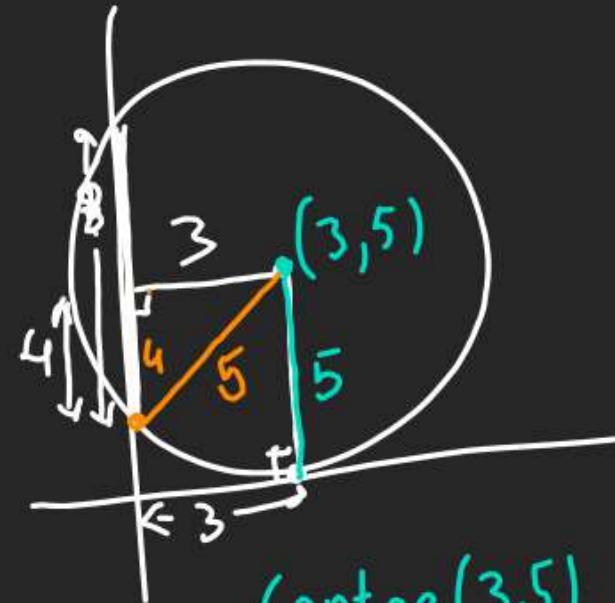

60
30
120
20
$(1,0)$
$(3,1)$

$$\frac{\left(\frac{y-1}{x-3}\right)-\left(\frac{y-0}{x-1}\right)}{1+\left(\frac{y-1}{x-3}\right)\left(\frac{y-0}{x-1}\right)} = \pm \tan 30°$$
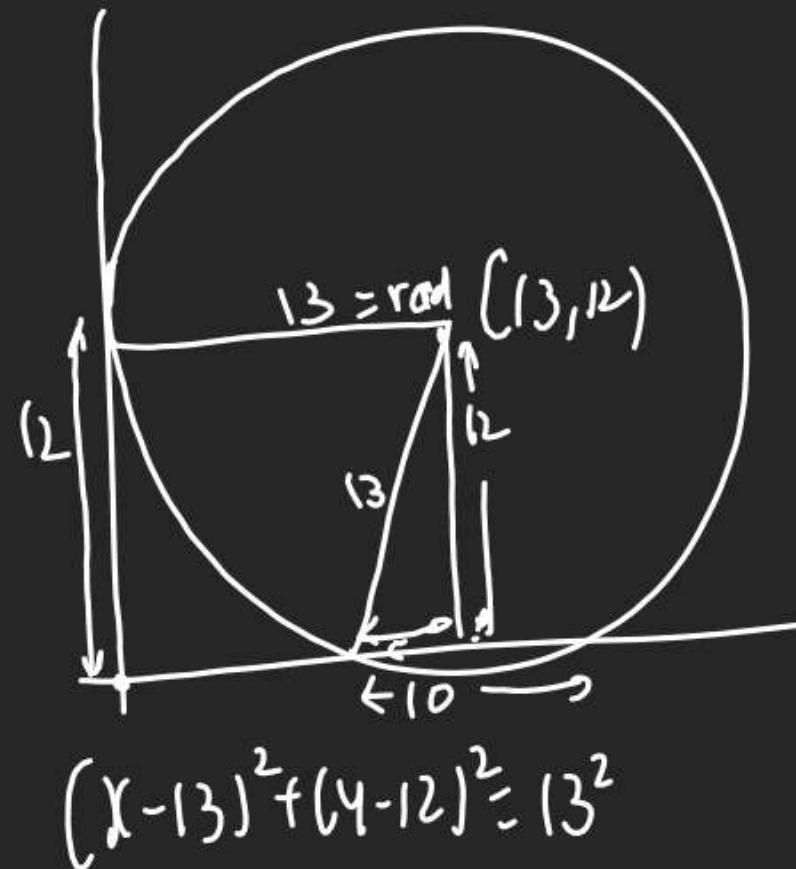
DY


Q Circle touches x Axis at 3 unit distance from Origin & makes Intercept at y Axis of 8 unit find EOC if Circle's centre is in 1st Quad

3
$(3,5)$
4 5 5
$\leftarrow 3 \rightarrow$

Centre $(3,5)$
$rad = 5$
$\Rightarrow (x-3)^2 + (y-5)^2 = 5^2$

Q Circle touches y Axis at 12 Unit dist. from Origin making Intercept on x Axis of 10 unit length & Centre in 2nd Quad find EOC.

$13 = rad$ $(13, 12)$
12 12
13
$\leftarrow 10 \rightarrow$

$$(x-13)^2 + (y-12)^2 = 13^2$$

Q Find Locus of Pt. of Int.

of Lines $(x+2y)+\lambda(x-2y)=0$
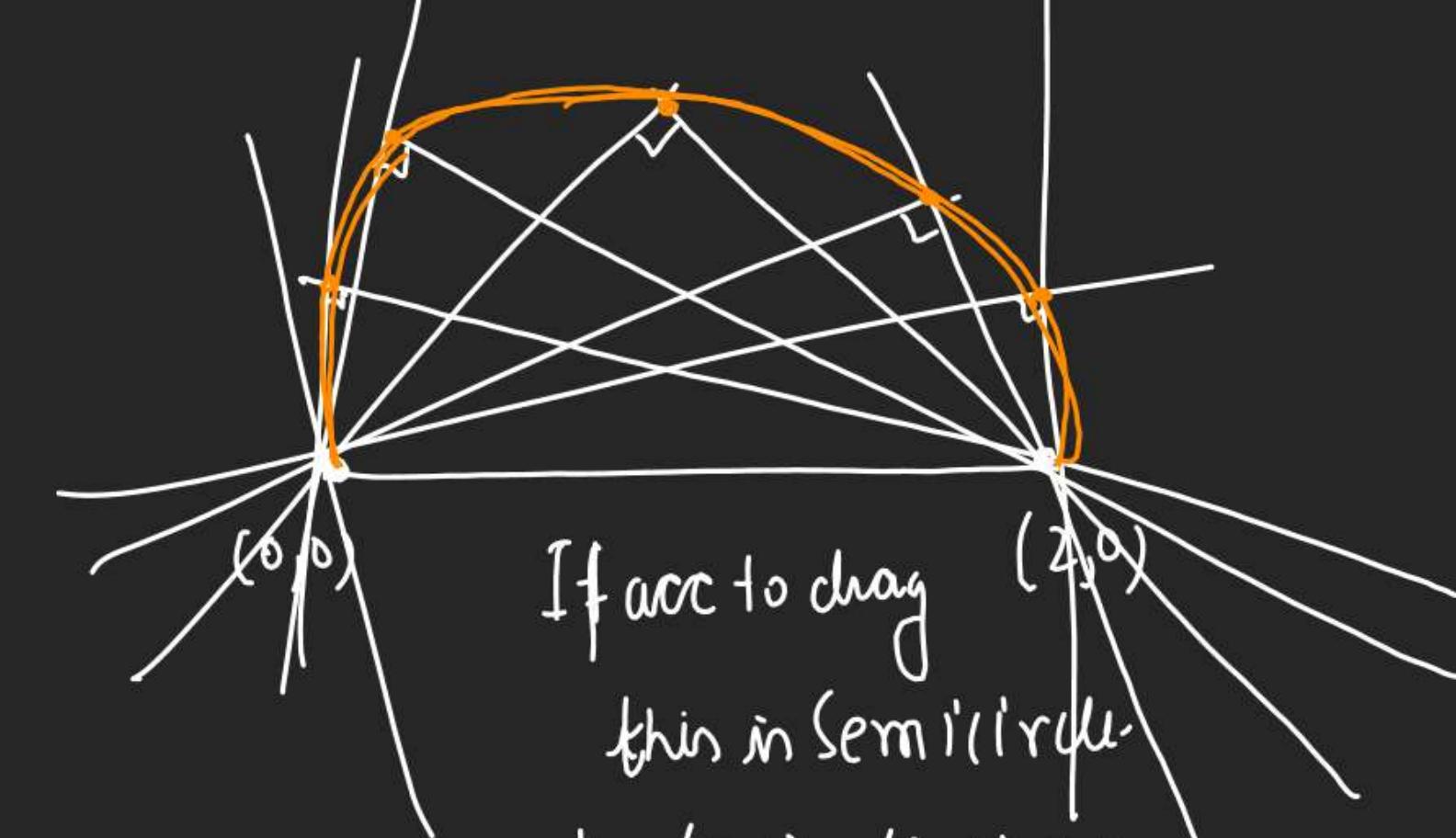
& $(x+y-2)+\mu(x-2)=0$

if Lines are Intersecting at 90°
always.

$L_1+\lambda L_2=0$

1) $(x+2y)+\lambda(x-2y)=0 \longrightarrow$ $x+2y=0$
$ x-2y=0$
 _____
$ x=0, y=0$

(2) $(x+y-2)+\mu(x-2)=0$ $x+y-2=0$
 $x-2=0 \Rightarrow x=2$
$ y=0$
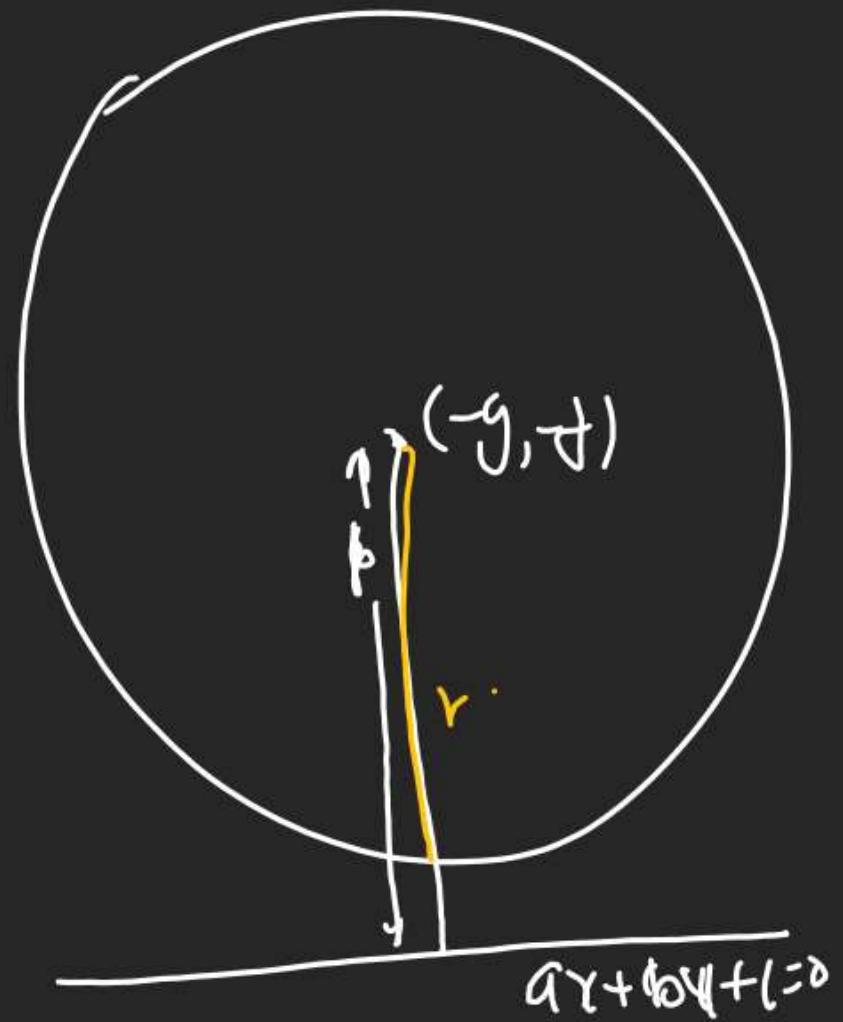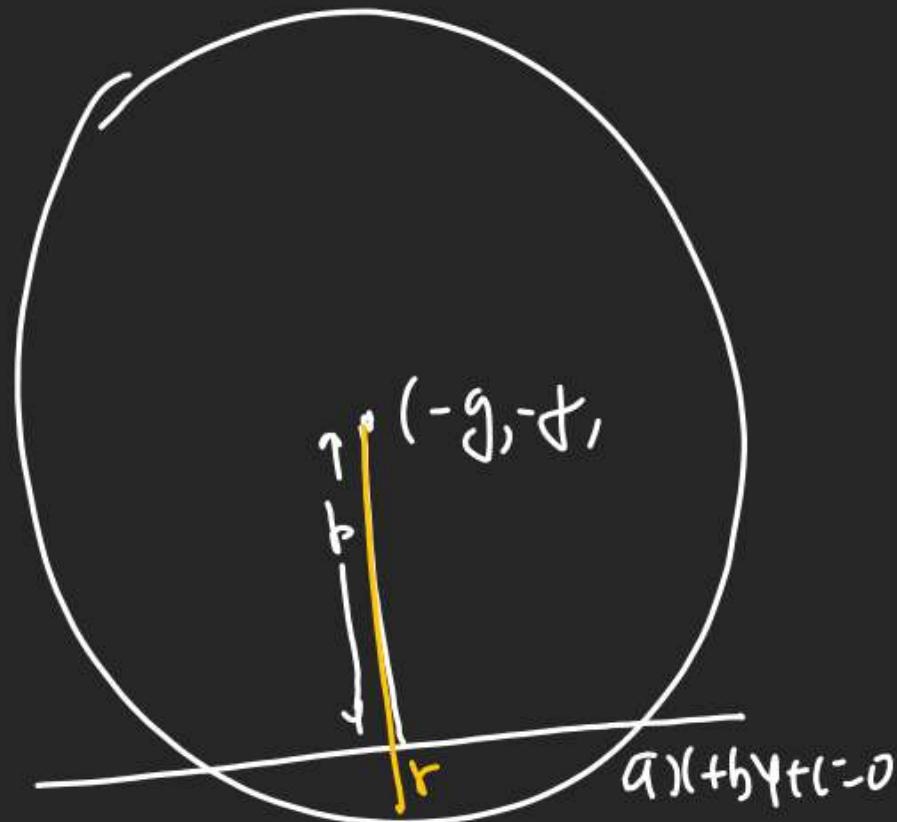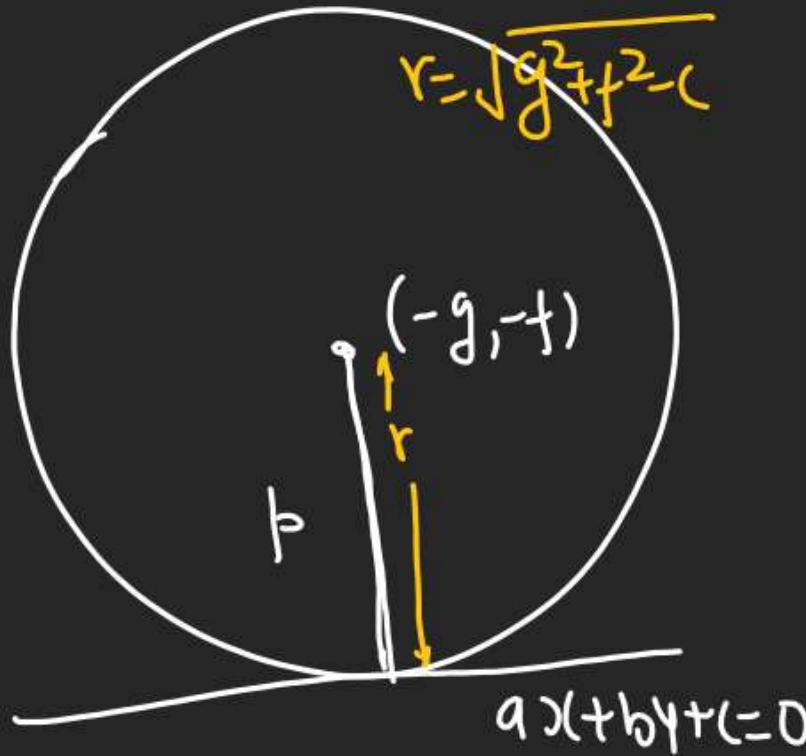
If acc to diag
this in Semicircle.
then $(0,0)$ & $(2,0)$ are
diametric End. Pt

∴ Circle → $(x-0)(x-2)+(y-0)(y-0)=0$

$x^2+y^2-2x=0$

$(0,0)$ $(2,0)$

Intercept

Intercept made by Circle on Line.

$$r = \sqrt{g^2 + f^2 - c}$$

$(-g, -f)$

$ax + by + c = 0$

Line touches

$$b = \frac{|-ag - bf + c|}{\sqrt{a^2 + b^2}}$$

$$\boxed{p = r}$$

$(-g, -f)$

$ax + by + c = 0$

Inteseting Circle.

$$r > p$$

$(-g, -f)$

$ax + by + c = 0$
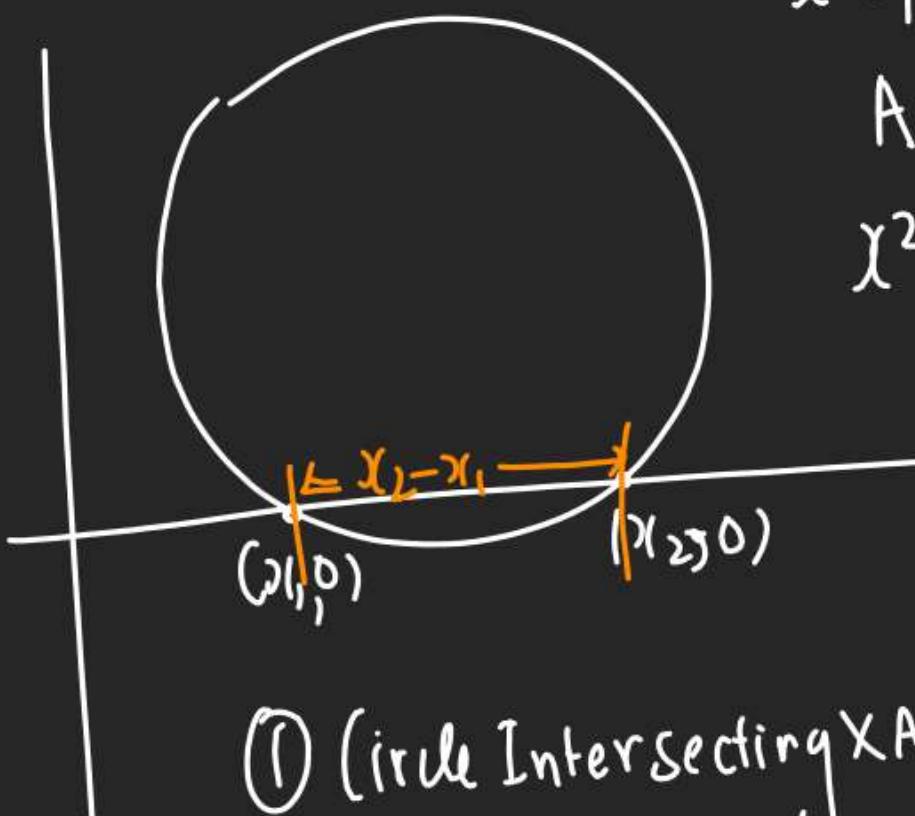
No touch No Cut

$$r < p$$

Intercept Made by X Axis

$$x^2 + y^2 + 2gx + 2fy + c = 0$$

At x axis $\Rightarrow y = 0$

$$x^2 + 2gx + c = 0 \begin{cases} \rightarrow x_1 \\ \rightarrow x_2 \end{cases}$$

$$x_1 + x_2 = -2g$$

$$x_1 x_2 = c$$

① Circle Intersecting X Axis

② PoI are $(x_1, 0)$ & $(x_2, 0)$

③ Length of Intercept made by X Axis

If Circle touches Both Axis $= |x_2 - x_1| = \sqrt{(x_1 + x_2)^2 - 4x_1 x_2}$

$$\boxed{c = g^2 = f^2}$$

$$= \sqrt{4g^2 - 4c} = 2\sqrt{g^2 - c}$$
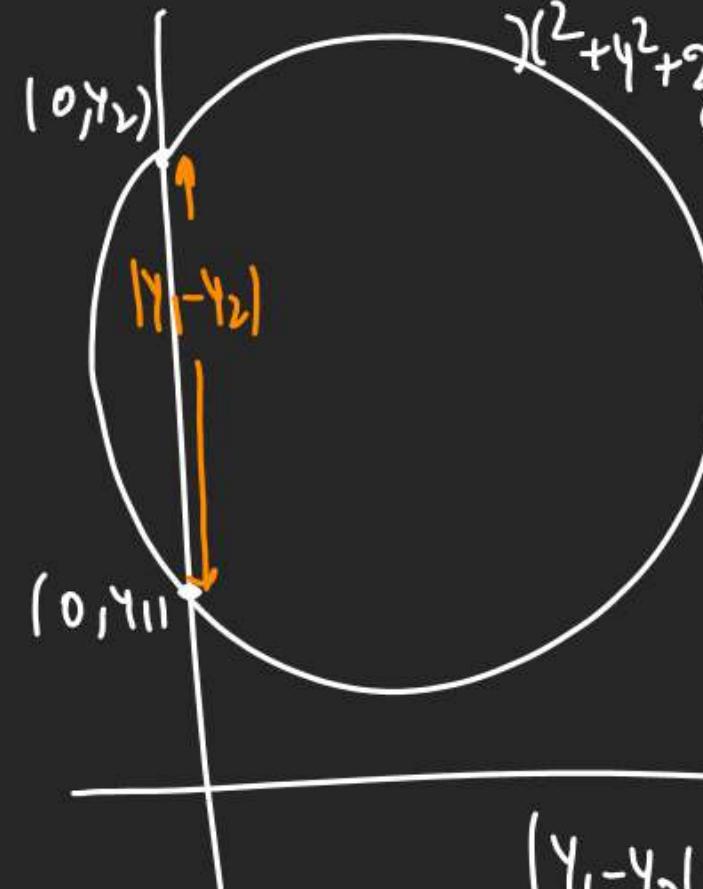
X Axis touches
Intercept = 0
$$2\sqrt{g^2 - c} = 0$$
$$\Rightarrow \boxed{c = g^2}$$

Intercept made by y Axis

$$x^2 + y^2 + 2gx + 2fy + c = 0$$

Putting $x = 0$

$$y^2 + 2fy + c = 0 \begin{cases} \rightarrow y_1 \\ \rightarrow y_2 \end{cases}$$

$$y_1 + y_2 = -2f, \quad y_1 y_2 = c$$

$(0, y_2)$ $|y_1 - y_2|$ $(0, y_1)$

$$|y_1 - y_2| = \sqrt{(y_1 + y_2)^2 - 4y_1 y_2}$$

$$= \sqrt{4f^2 - 4c}$$

$$\boxed{\text{Length of Intercept} = 2\sqrt{f^2 - c} \text{ made on Y Axis}}$$

If Y Axis
touches
Circle
$$\Rightarrow \boxed{c = f^2}$$

$|x_1 - x_1| = 2\sqrt{g^2 - c}$

① $g^2 - c = 0$ touches X Axis

② $g^2 - c > 0$ Normal Intercept

③ $g^2 - c < 0$ No Intercept

Q for $x^2 + y^2 - 2ax - 2ay + a^2 = 0$

Show that Circle touches
Both Axes.

$x^2 + y^2 \boxed{-2ax} \boxed{-2ay} + a^2 = 0$

$x^2 + y^2 + 2gx + 2fy + c = 0$

$g = -a \quad f = -a, \quad c = a^2$ touching Both Axes

$c = g^2 = f^2$ (check

$a^2 = (-a)^2 = (-a)^2$ ✓ True

Q Find Length of Intercept
made by Circle.

$x^2 + y^2 - 4x - 64 - 5 = 0$
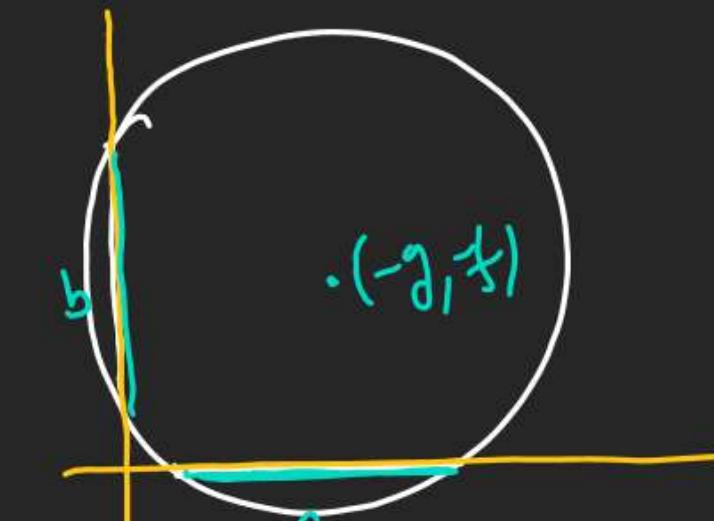
on X & Y Axis?

Intercept X Axis $= 2\sqrt{g^2 - c} = 2\sqrt{(-2)^2 + 5}$
$= 6$

Y Axis $= 2\sqrt{f^2 - c} = 2\sqrt{(-3)^2 + 5}$
$= 2\sqrt{14}$

Q If 2 Rods of length a & b are Sliding
on 2 ⊥ lines such that their
end Pts always lying on a circle
Show that locus of centre of circle is
$4(x^2 - y^2) = a^2 - b^2$

$\cdot (-g, f)$

$2\sqrt{g^2 - c} = a$

$2\sqrt{f^2 - c} = b$

$4(g^2 - c) = a^2$

$4(f^2 - c) = b^2$

_____

$4(g^2 - f^2) = a^2 - b^2$

$4(x^2 - y^2) = a^2 - b^2$