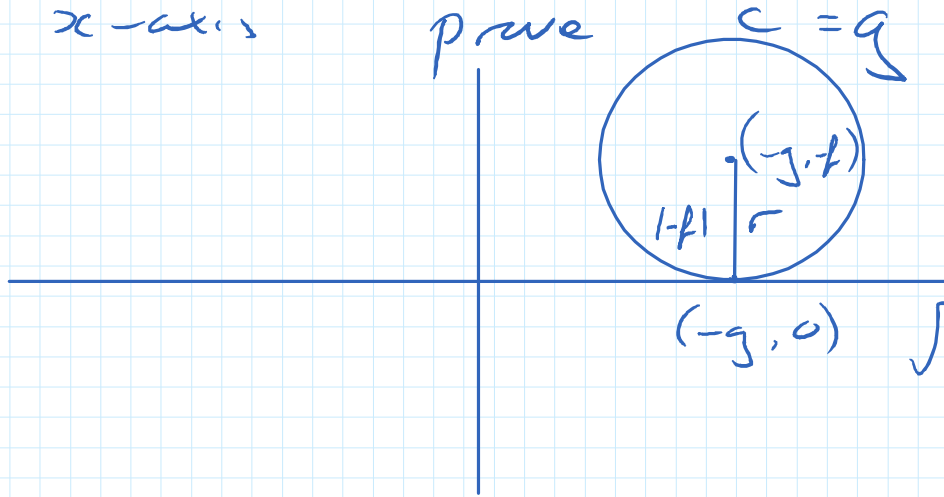


Touching the axes.

$x^2 + y^2 + 2gx + 2fy + c = 0$ touches the x-axis
 prove $c = g^2$



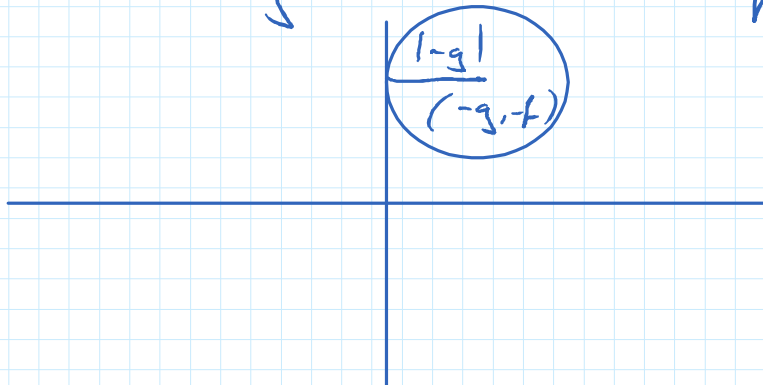
Centre $(-g, -f)$
 $r = \sqrt{g^2 + f^2 - c}$

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

$$g^2 + f^2 - c = f^2$$

$$g^2 = c$$

Touch y-axis $c = f^2$

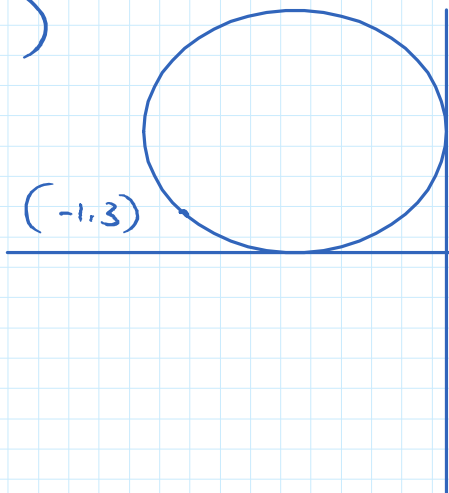


$$\sqrt{g^2 + f^2 - c} = |g|$$

$$g^2 + f^2 - c = g^2$$

$$c = f^2$$

Find 2 circles through $(-1, 3)$ which touch both axes.



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

Centre $(-g, -f)$

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

$(-1, 3)$ $-2g + 6f + c = -10$

x-axis : $c = g^2$

y-axis : $c = f^2$

$$y\text{-axis: } c = f^2$$

$$g^2 = f^2$$

$$g = \pm f$$

$$g = -f$$

$$-2g + 6f + c = -10$$

$$2f + 6f + f^2 + 10 = 0$$

$$f^2 + 8f + 10 = 0$$

-b formula.