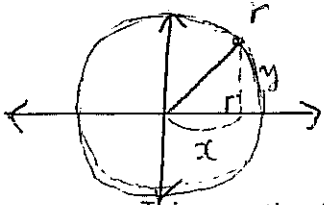


A circle is the set of all points in a plane that are the same distance from a fixed point, the centre. The distance from any point on the circle to the centre is called a **radius**.

If the centre of the circle is at the origin of the x - y plane and the radius is r units, then



$$x^2 + y^2 = r^2$$

same as

$$a^2 + b^2 = c$$

which is Pythagorean theorem.

This equation is the equation of a circle with centre $(0, 0)$ and radius r .

Communicate Using the distance from the origin formula, how can you explain why this makes sense?

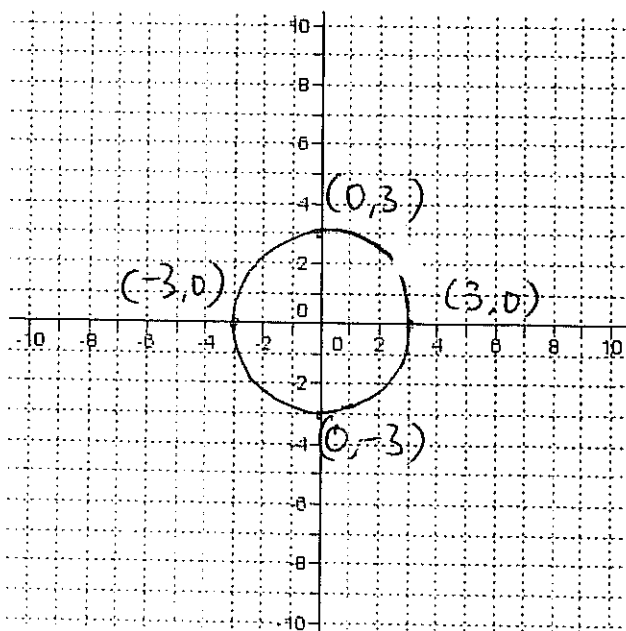
The distance from the origin (or radius of a circle) is same everywhere on the circle.

Example 1 Write the equation of a circle with centre $(0, 0)$ and a radius of $\frac{1}{2}$

$$x^2 + y^2 = \left(\frac{1}{2}\right)^2$$

$$x^2 + y^2 = \frac{1}{4}$$

Example 2 A circle is defined by the equation $x^2 + y^2 = 9$. Sketch a graph of this circle.



$$x^2 + y^2 = r^2$$

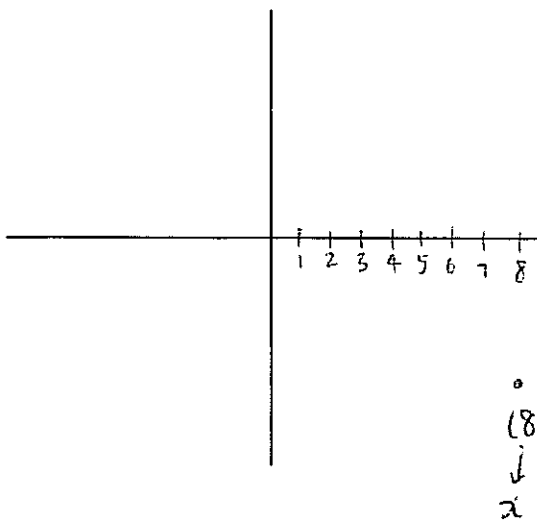
$$x^2 + y^2 = 9$$

$$r^2 = 9$$

$$\sqrt{r^2} = \sqrt{9}$$

$$r = 3$$

Example 3 A circle has centre $(0, 0)$ and passes through the point $(8, -6)$. Find the equation of the circle. What are the coordinates of the other point of the diameter that passes through $(8, -6)$?



$$x^2 + y^2 = r^2$$

$$8^2 + (-6)^2 = r^2$$

$$64 + 36 = r^2$$

$$100 = r^2$$

$$\sqrt{100} = \sqrt{r^2}$$

$$10 = r$$

$$\therefore \text{Eq of circle} \Rightarrow x^2 + y^2 = 100$$

Example 4 A stone is dropped into a pond and sends out a circular ripple whose radius increases by 5 cm/s . Find the equation of the circle 12 s after the stone is dropped.

Example 5 Circle not centred at the origin

a) Find the equation of a circle with radius 4, centred at the point $(2, -3)$. *Hint: Use the distance between two points formula.*

b) Find the equation of a circle with radius 9, centred at the point $(-5, -10)$.