CLASS-11
CHAPTER-11
CIRCLES

Excercise 11.1

Q2. Find the centre and radius of the given circle $(x+5)^2 + (y{-}3)^2 = 36$.
Solution:
Given circle equation is

$$(\mathbf{x}+5)^2 + (\mathbf{y}{-}3)^2 = 36 \tag{1}$$

The general equation of the circle is

$$\|\mathbf{x}\|^2 + 2\mathbf{u}^\top \mathbf{x} + f = 0 \tag{2}$$

Where,

$$\mathbf{u} = -\mathbf{c} \text{ and } f = \|\mathbf{u}\|^2 - r^2 \tag{3}$$

by expanding (1)

$$\mathbf{x}^2 + 10\mathbf{x} + 25 + \mathbf{y}^2 - 6\mathbf{y} + 9 - 36 = 0 \tag{4}$$

$$\|\mathbf{x}\|^2 + 2\begin{pmatrix} 5 & -3 \end{pmatrix}\mathbf{x} - 2 = 0 \tag{5}$$

by comparing (3) to (5) we get

$$\mathbf{u} = \begin{pmatrix} 5 \\ -3 \end{pmatrix} \tag{6}$$

$$f = -2 \tag{7}$$

$$\mathbf{c} = \begin{pmatrix} -5 \\ 3 \end{pmatrix} \tag{8}$$

$$\|u\|^2 = 34 \tag{9}$$

$$r^2 = \|u\|^2 - f \tag{10}$$

$$r^2 = 36, r = \pm 6 \tag{11}$$

radius of circle is positive so the centre and radius of $(x+5)^2 + (y{-}3)^2 = 36$.
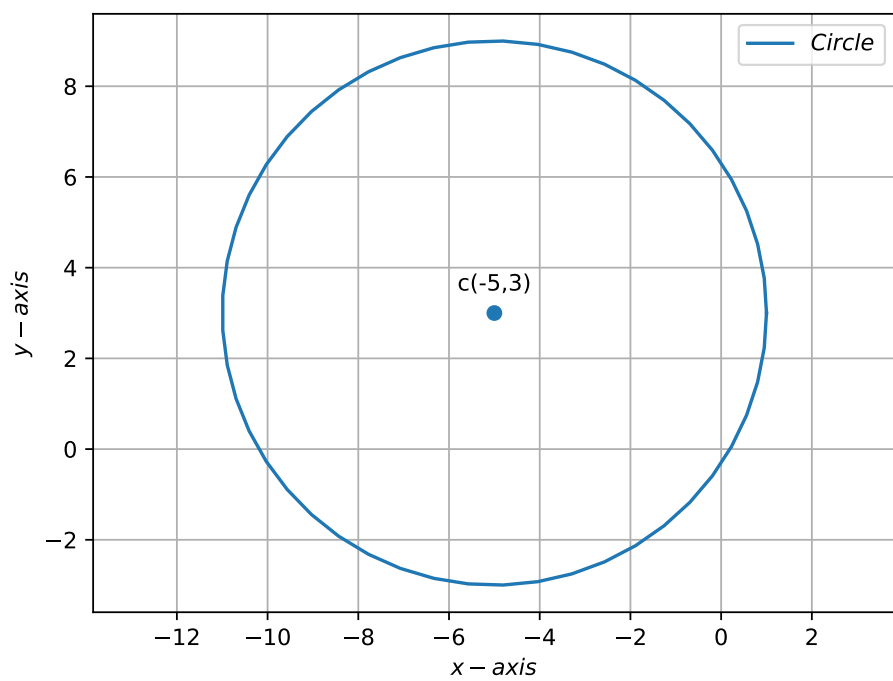is $\begin{pmatrix} -5 \\ 3 \end{pmatrix}$ and 6 respectively

Figure 1: