# 11.11.1.7

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Class 11, Chapter 11, Exercise 1.7

Q. Find the centre and radius of the circle $x^2 + y^2 - 4x - 8y - 45 = 0$.

**Solution:** The equation of the circle in vector form is given by

$$\|\mathbf{x}\|^2 + 2\mathbf{x}^\top\mathbf{u} + f = 0 \tag{1}$$

where

$$\mathbf{u} = -\mathbf{c} \tag{2}$$

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

The given circle is

$$\|\mathbf{x}\|^2 + 2\mathbf{x}^\top\begin{pmatrix}-2\\-4\end{pmatrix} - 45 = 0 \tag{4}$$

Comparing the equations (1) and (4), we get

$$\mathbf{u} = \begin{pmatrix}-2\\-4\end{pmatrix} \tag{5}$$

$$\implies \mathbf{c} = \begin{pmatrix}2\\4\end{pmatrix} \tag{6}$$

$$f = \|\mathbf{c}\|^2 - r^2 \tag{7}$$

$$\implies -45 = \left(\sqrt{2^2 + 4^2}\right)^2 - r^2 \tag{8}$$

$$\implies r^2 = 65 \tag{9}$$

$$\implies r = \sqrt{65} \tag{10}$$

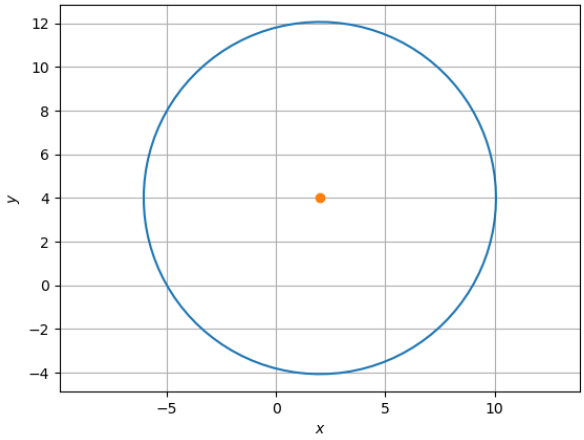


Fig. 1: Circle