Question: 11.11.1.5

Nikam Pratik Balasaheb (EE21BTECH11037)

1 Problem

Find the equation of circle with centre $\begin{pmatrix}-a\\-b\end{pmatrix}$ and radius $\sqrt{a^2-b^2}$.

2 Solution

centre of the given circle,

$$\mathbf{O} = \begin{pmatrix}-a\\-b\end{pmatrix} \tag{2.0.1}$$

The radius of given circle, $r = \sqrt{a^2-b^2}$ The equation of given circle is,

$$\|\mathbf{x}-\mathbf{O}\|^2 = r^2 \tag{2.0.2}$$

$$\|\mathbf{x}\|^2 - 2\mathbf{O}^\top\mathbf{x} + \|\mathbf{O}\|^2 = r^2 \tag{2.0.3}$$

$$\|\mathbf{x}\|^2 - 2\begin{pmatrix}-a & -b\end{pmatrix}\mathbf{x} + a^2 + b^2 = a^2 - b^2 \tag{2.0.4}$$

$$\|\mathbf{x}\|^2 + 2\begin{pmatrix}a & b\end{pmatrix}\mathbf{x} + 2b^2 = 0 \tag{2.0.5}$$

Values used for plottting the figure:

Condition	Inference
$\|\mathbf{x}-\mathbf{O}\|^2 < r^2$	point lies inside the circle
$\|\mathbf{x}-\mathbf{O}\|^2 > r^2$	point lies outside the circle
$\|\mathbf{x}-\mathbf{O}\|^2 = r^2$	point lies on the circle

TABLE 0: Table1

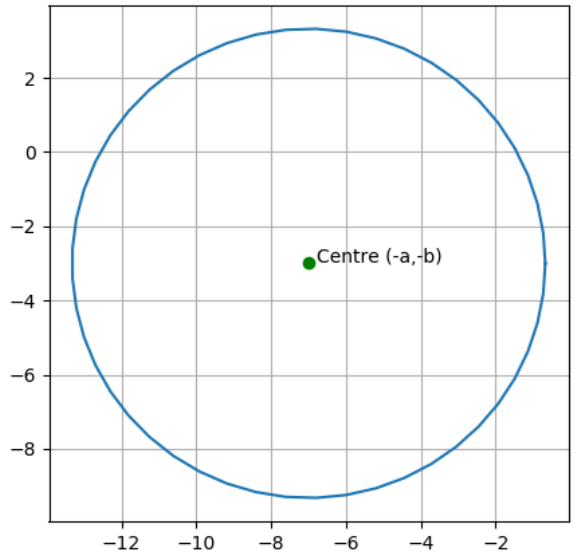

Fig. 0: Figure 1