भारतीय प्रौद्योगिकी संस्थान हैदराबाद
Indian Institute of Technology Hyderabad

Name:SHAIK KHAJA MASTAN AHMED
Roll No.: FWC22052
19pa1a04e9@vishnu.edu.in
Oct 2022

MATRIX : CIRCLE ASSIGNMENT

0.1 Problem:

Find the point diametrically opposite to the point P(1,0) on the circle $x^2 + y^2 + 2x + 4y - 3 = 0$.

0.2 Solution:

Input Parameters :

$$\text{Circle Equation : } x^2 + y^2 + 2x + 4y - 3 = 0.$$

$$\text{Point P } \begin{pmatrix} 1 \\ 0 \end{pmatrix}.$$

To Find :

1. Comparing the given circle equation with the standard equation of the conics and finding it's parameters.
2. Finding the Radius of the Circle.
3. Finding the Center of the Circle.
4. Finding the required point diametrically opposite to the point P(1,0).

Step - 1 :

Circle equation : $x^2 + y^2 + 2x + 4y - 3 = 0$
The standard equation of the conics is given as :

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

The given circle can be expressed as conics with parameters

$$\mathbf{V} = \mathbf{I}, \mathbf{u} = \begin{pmatrix} 1 \\ 2 \end{pmatrix}, f = -3 \tag{2}$$

Step - 2 :

Radius of the Circle:

$$r = \sqrt{\mathbf{u}^\top \mathbf{u} - f} \tag{3}$$

$$\therefore r = \sqrt{8}.$$

Step - 3 :

Centre of the Circle :

$$\mathbf{A} = -u \tag{4}$$

$$\therefore \mathbf{A} = -\begin{pmatrix} 1 \\ 2 \end{pmatrix}.$$

Step - 4 :

Let, Q be the point diametrically opposite to the point P.
$\therefore$ Using mid point formula we can find the point Q.

$$\mathbf{A} = \frac{\mathbf{P} + \mathbf{Q}}{2} \tag{5}$$

$$\therefore \mathbf{Q} = 2\mathbf{A} \text{ - } \mathbf{P}$$

Code Link :

The below link realises the code of the above construction.

```
https://github.com/19pa1a04e9/FWC-IITH/tree/
main/Assignment-1/MATRICES/Circle/codes/
circle.py
```

0.3 Termux Commands :

bash rncom.sh ..... Using Shell commands.

0.4 Plot :