MATRICES USING PYTHON

THOUTU RAHUL RAJ
rdj4648@gmail.com
FWC22008 IITH Future Wireless Communication (FWC) ASSIGN-5

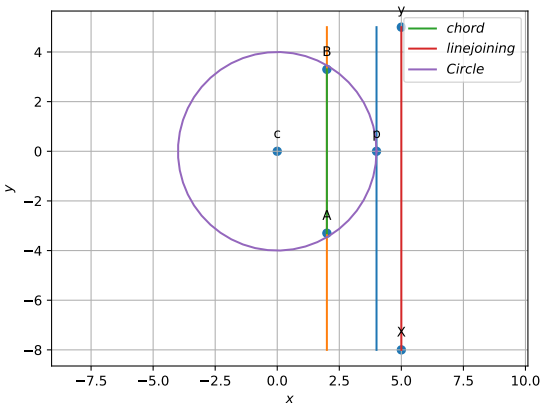
Contents

1 Problem

Draw a circle and two lines parallel to a given line such that one is a tangent and the other is a secant to the circle

2 Construction

Figure of Construction



The input parameters for this construction are

Symbol	Value	Description
r	4	Radius of the circle
c	5	constant
C	$\begin{pmatrix}0\\0\end{pmatrix}$	center

3 Solution

Termux commands :

```
python3 xyz.py
```

To Prove: In a given circle and a line draw two lines such that one is a secant and other one is tangent.

Given: Circle center with (0,0), radius 4 and a line.

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

$\mathbf{V} = \begin{pmatrix}1 & 0\\0 & 1\end{pmatrix}$, $\mathbf{u}=\begin{pmatrix}0\\0\end{pmatrix}$ f = -16

By substituting above values in the equation (1) , we get cirle equation.

Now let us take the given line equation as

$$\mathbf{n}^t x = 5 \tag{2}$$

condition for tanget to the given circle will be

$$D = \pm C \tag{3}$$

$$\mathbf{D} = \pm\sqrt{e^2\left(\mathbf{u}^\top \mathbf{n}\right)^2 - \lambda_2\left(e^2-1\right)\left(\|\mathbf{u}\|^2 - \lambda_2 f\right)} \tag{4}$$

by sloving the above eq we get,

$$D = \pm 4 \tag{5}$$

and the condition for secant which is also parallel to the given line will be

$$D \geq 0 \tag{6}$$

i.e

$$-4 < C < 4 \tag{7}$$

The below python code realizes the above construction:

https://github.com/Rahulraj00/Assignments/tree/main/Assignments/assg_5/xyz.py