MATRICES USING PYTHON

T.MANASAREDDY
manasatanuboddi@gmail.com
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1 Problem

If the lines 3x-4y-7=0 and 2x-3y-5=0 are two diameters of a circle of area 49 π square units,the equation of the circle is

2 Construction

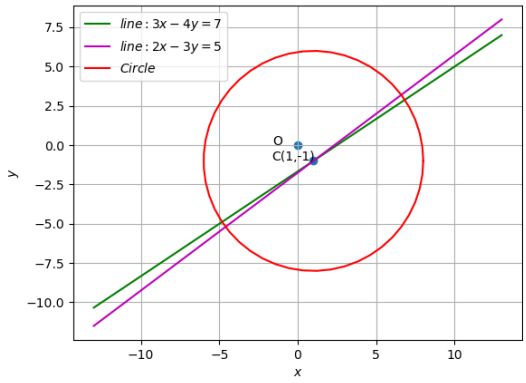

Figure of construction

3 Solution

The area of the Circle is 49 π
Let r be the radius of circle,

$$\pi r^2 = 49\pi \tag{1}$$

$$r = 7 \tag{2}$$

The diameter equations are:

$$3x - 4y - 7 = 0 \tag{3}$$

$$2x - 3y - 5 = 0 \tag{4}$$

From the above we obtain the matrix equations:

$$\begin{pmatrix} 3 & -4 \\ 2 & -3 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 7 \\ 5 \end{pmatrix}$$

The augmented matrix can be expressed as,

$$\begin{pmatrix} 3 & -4 & 7 \\ 2 & -3 & 5 \end{pmatrix}$$

The standard equation of the conics is given as :

$$\begin{pmatrix} 1 & 0 & 1 \\ 0 & 1 & -1 \end{pmatrix}$$

From this we can find the center points of x and y

$$\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 1 \\ -1 \end{pmatrix}$$

$$\mathbf{c} = \begin{pmatrix} 1 \\ -1 \end{pmatrix}$$

The standard equation of the conics is given as :

$$\mathbf{x}^\top \mathbf{V}\mathbf{x} + 2\mathbf{u}^\top \mathbf{x} + f = 0 \tag{5}$$

$$\implies \mathbf{x}^T \mathbf{I}\, \mathbf{x} + 2 \begin{pmatrix} -1 \\ 1 \end{pmatrix}^T \mathbf{x} - 47 = 0$$

$$\mathbf{V} = \mathbf{I}, \mathbf{u} = -\begin{pmatrix} 1 \\ -1 \end{pmatrix}, f = -47 \tag{6}$$

3.1 Deriving equation for Circle in quadratic form

$$(x - x1)^2 + (y - y1)^2 = r^2$$

$$(x - 1)^2 + (y + 1)^2 = 7^2$$

$$x^2 + y^2 - 2x + 2y - 47 = 0 \tag{7}$$

bash bash2.sh.....using shell command

Below python code realizes the above construction :

https://github.com/manasareddy/FWC_module1/blob/main/matrices/circle/codes/matrix.py