Assignment 3

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Download all python codes from

https://github.com/ka-raja-babu/Matrix-Theory/tree/main/Assignment3/Codes

and latex-tikz codes from

https://github.com/ka-raja-babu/Matrix-Theory/tree/main/Assignment3

1 Question No. 52

With the same centre **O**,draw two circles of radii 2.5 and 4.

2 Solution

Let the centre of given circles be (assuming any arbitrary value):

$$\mathbf{O} = \begin{pmatrix} -1 \\ 2 \end{pmatrix} \tag{2.0.1}$$

According to given data,radii of circles are:

$$r1 = 2.5 \tag{2.0.2}$$

$$r2 = 4 \tag{2.0.3}$$

The general equation of a circle is given by:

$$\|\mathbf{x} - \mathbf{O}\|^2 = r^2 \tag{2.0.4}$$

$$\implies \mathbf{x}^T\mathbf{x} - 2\mathbf{O}^T\mathbf{x} + \|\mathbf{O}\|^2 - r^2 = 0 \tag{2.0.5}$$

where **O** and r are centre and radius of given circle respectively.
So,the equation of circle1 having r=2.5 is:

$$\mathbf{x}^T\mathbf{x} - 2\begin{pmatrix} -1 \\ 2 \end{pmatrix}^T \mathbf{x} + (\sqrt{5})^2 - 2.5^2 = 0 \tag{2.0.6}$$

$$\implies \mathbf{x}^T\mathbf{x} - 2\begin{pmatrix} -1 & 2 \end{pmatrix}\mathbf{x} + 5 - 6.25 = 0 \tag{2.0.7}$$

Similarly,the equation of circle2 having r=4 is:

$$\mathbf{x}^T\mathbf{x} - 2\begin{pmatrix} -1 \\ 2 \end{pmatrix}^T \mathbf{x} + (\sqrt{5})^2 - 4^2 = 0 \tag{2.0.8}$$

$$\implies \mathbf{x}^T\mathbf{x} - 2\begin{pmatrix} -1 & 2 \end{pmatrix}\mathbf{x} + 5 - 16 = 0 \tag{2.0.9}$$

	Circle1	Circle2
Centre	$\begin{pmatrix} -1 \\ 2 \end{pmatrix}$	$\begin{pmatrix} -1 \\ 2 \end{pmatrix}$
Radius	2.5	4

TABLE 2.1: Input values

Eq. (2.0.7) and eq.(2.0.9) are then plotted using values from table 2.1 to get required fig. 2.1.
Plot of concentric circles:

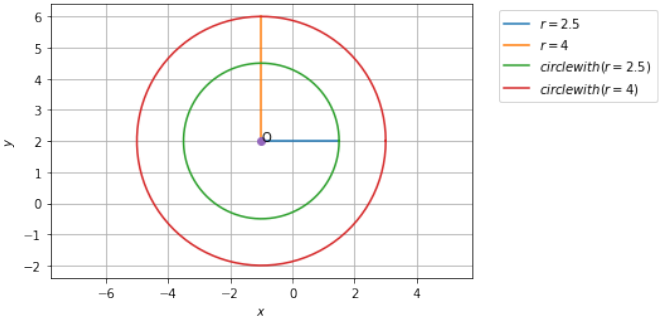

Fig. 2.1: Concentric circles with centre (-1,2) and radii 2.5 and 4 respectively