

Matrix Theory(EE5609) Assignment 5

Anshum Agrawal
Roll No- AI20MTECH11006

Abstract—This Assignment finds the radius and centre of a given circle.

Download latex-tikz codes from

<https://github.com/anshum0302/EE5609/blob/master/assignment5/assign5.tex>

1 PROBLEM STATEMENT

Find the radius and the coordinates of the centre of the circle

$$\mathbf{x}^T \mathbf{x} = a^2 + b^2 \quad (1.0.1)$$

2 SOLUTION

The general equation of a circle is given by

$$\mathbf{x}^T \mathbf{x} - 2\mathbf{c}^T \mathbf{x} + f = 0 \quad (2.0.1)$$

where \mathbf{c} is the centre of the circle and $r = \sqrt{\|\mathbf{c}\|^2 - f}$ is the radius of the circle

Equation of circle given in (1.0.1) can be rewritten as

$$\mathbf{x}^T \mathbf{x} - 2 \begin{pmatrix} 0 \\ 0 \end{pmatrix}^T \mathbf{x} + (-(a^2 + b^2)) = 0 \quad (2.0.2)$$

Comparing (2.0.1) and (2.0.2) we get

$$\mathbf{c} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} \quad (2.0.3)$$

$$f = -(a^2 + b^2) \quad (2.0.4)$$

Then centre of the circle (1.0.1) is $\mathbf{c} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$ and radius

$$r = \sqrt{\|\mathbf{c}\|^2 - f} = \sqrt{a^2 + b^2}$$