

Assignment 4

Priyanka - EE21MTECH12002

Download all python codes from

https://github.com/PeriPriyanka/Quadratic_forms_assign/Assignment4/code

and latex-tikz codes from

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Tangent to circle parallel to x-axis will be of the form

$$y = k \quad (2.0.11)$$

The value of k is the height of tangent from the x-axis.

$$\mathbf{k} = \mathbf{r} + \mathbf{O}_y \quad (2.0.12)$$

$$\mathbf{k} = 2 \quad (2.0.13)$$

$$(2.0.14)$$

1 PROBLEM

(Quadratic forms 2.4) Find the points on the curve given at which tangents are parallel to x-axis

$$\mathbf{x}^T \mathbf{x} - 2 \begin{pmatrix} 1 & 0 \end{pmatrix} \mathbf{x} - 3 = 0 \quad (1.0.1)$$

2 SOLUTION

Consider the equation (1.0.1)

$$\mathbf{x}^T \mathbf{x} - 2 \begin{pmatrix} 1 & 0 \end{pmatrix} \mathbf{x} - 3 = 0 \quad (2.0.1)$$

where,

$$\mathbf{X} = \begin{pmatrix} x \\ y \end{pmatrix} \quad (2.0.2)$$

Comparing the equation with standard form of circle

$$\mathbf{x}^T \mathbf{x} - 2\mathbf{O}^T \mathbf{x} + \|\mathbf{O}\|^2 - \mathbf{r}^2 = 0 \quad (2.0.3)$$

$$(2.0.4)$$

where O is the origin and r is the radius of the circle we get,

$$\mathbf{O} = \begin{pmatrix} O_x \\ O_y \end{pmatrix} \quad (2.0.5)$$

$$\mathbf{O} = \begin{pmatrix} 1 \\ 0 \end{pmatrix} \quad (2.0.6)$$

$$\|\mathbf{O}\|^2 = 1 \quad (2.0.7)$$

$$\|\mathbf{O}\|^2 - \mathbf{r}^2 = -3 \quad (2.0.8)$$

$$\mathbf{r}^2 = 1 + 3 = 4 \quad (2.0.9)$$

$$\mathbf{r} = 2 \quad (2.0.10)$$

Equation of tangent

$$y = 2 \quad (2.0.15)$$

The point on the circle where tangent is parallel to x-axis is given by

$$\mathbf{P} = \begin{pmatrix} P_x \\ P_y \end{pmatrix} = \begin{pmatrix} 1 \\ 2 \end{pmatrix} \quad (2.0.16)$$

Plot of tangent and circle are shown in the Fig0

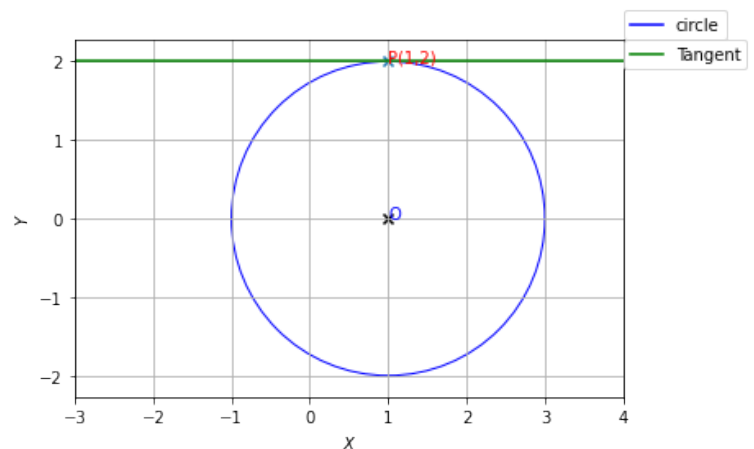


Fig. 0: Plot of circle.