Assignment 5

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Download all python codes from

https://github.com/SavaranaDatta/EE3900/blob/main/EE3900_As5/codes/EE3900_As5.py

Download latex-tikz codes from

https://github.com/SavaranaDatta/EE3900/blob/main/EE3900_As5/EE3900_As5.tex

1 Problem(Quadratic Forms Q.2.5)

Find the area of the region in the first quadrant enclosed by x-axis, line $\begin{pmatrix}1 & -\sqrt{3}\end{pmatrix}\mathbf{x} = 0$ and the circle $\mathbf{x}^\top\mathbf{x} = 4$.

2 Solution

The direction vector of the line

$$\begin{pmatrix}1 & -\sqrt{3}\end{pmatrix}\mathbf{x} = 0 \tag{2.0.1}$$

is

$$\mathbf{c} = \begin{pmatrix}\sqrt{3}\\1\end{pmatrix} \tag{2.0.2}$$

and the direction vector of x-axis is

$$\mathbf{e} = \begin{pmatrix}1\\0\end{pmatrix} \tag{2.0.3}$$

angle between $\mathbf{c}$ and $\mathbf{e}$ is

$$\cos\theta = \frac{\mathbf{c}^\top\mathbf{e}}{\|\mathbf{c}\|\|\mathbf{e}\|} \tag{2.0.4}$$

$$= \frac{\sqrt{3}}{2} \tag{2.0.5}$$

$$\implies \theta = 30^\circ \tag{2.0.6}$$

$$\text{area of the sector} = \left(\frac{\theta}{360^\circ}\right)\pi r^2 \tag{2.0.7}$$

$$= \frac{\pi}{3} \tag{2.0.8}$$

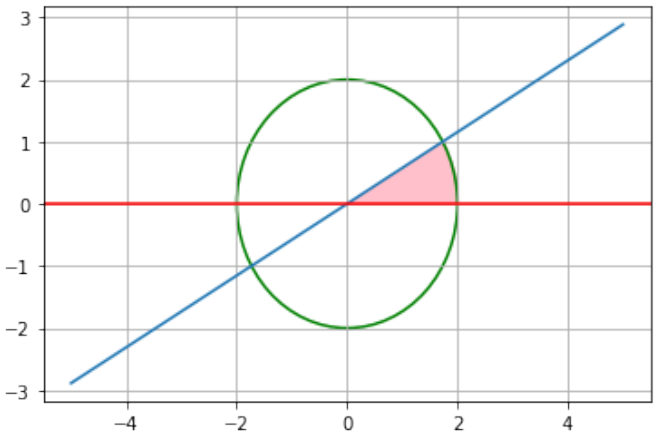

Fig. 0: Reference plot