Assignment 4

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***Abstract*—This document finds the area bounded by curves**

Download python codes from

https://github.com/priya6971/matrix_theory_EE5609/tree/master/Assignment4/codes

Download latex-tikz codes from

https://github.com/priya6971/matrix_theory_EE5609/tree/master/Assignment4

1 Problem

Find the area bounded by curves $\left\|\mathbf{x}-\begin{pmatrix}1\\0\end{pmatrix}\right\|=1$ and $\|\mathbf{x}\|=1$.

2 Solution

General equation of circle is $\mathbf{x}^T\mathbf{x}+2\mathbf{u}^T\mathbf{x}+\mathrm{f}=0$
Taking equation of the first curve to be,

$$\left\|\mathbf{x}-\begin{pmatrix}1\\0\end{pmatrix}\right\|^2=1^2 \tag{2.0.1}$$

$$\mathbf{x}^T\mathbf{x}+2\mathbf{u_1}^T\mathbf{x}=0 \tag{2.0.2}$$

$$\mathbf{u_1}=\begin{pmatrix}-1\\0\end{pmatrix} \tag{2.0.3}$$

$$f_1=0 \tag{2.0.4}$$

$$\mathbf{O_1}=\begin{pmatrix}1\\0\end{pmatrix} \tag{2.0.5}$$

Taking equation of the second curve to be,

$$\|\mathbf{x}\|^2+2\mathbf{u}_2^T\mathbf{x}+f_2=0 \tag{2.0.6}$$

$$\mathbf{x}^T\mathbf{x}-1=0 \tag{2.0.7}$$

$$\mathbf{u_2}=\begin{pmatrix}0\\0\end{pmatrix} \tag{2.0.8}$$

$$f_2=-1 \tag{2.0.9}$$

$$\mathbf{O_2}=\begin{pmatrix}0\\0\end{pmatrix} \tag{2.0.10}$$

Now, subtracting equation (2.0.2) from (2.0.7) We get,

$$\mathbf{x}^T\mathbf{x}+2\mathbf{u_1}^T\mathbf{x}-\mathbf{x}^T\mathbf{x}-f_2=0 \tag{2.0.11}$$

$$2\mathbf{u}^T\mathbf{x}=-1 \tag{2.0.12}$$

$$\begin{pmatrix}-2 & 0\end{pmatrix}\mathbf{x}=-1 \tag{2.0.13}$$

Which can be written as:-

$$\begin{pmatrix}1 & 0\end{pmatrix}\mathbf{x}=1/2 \tag{2.0.14}$$