Matrix Assignment - Conics

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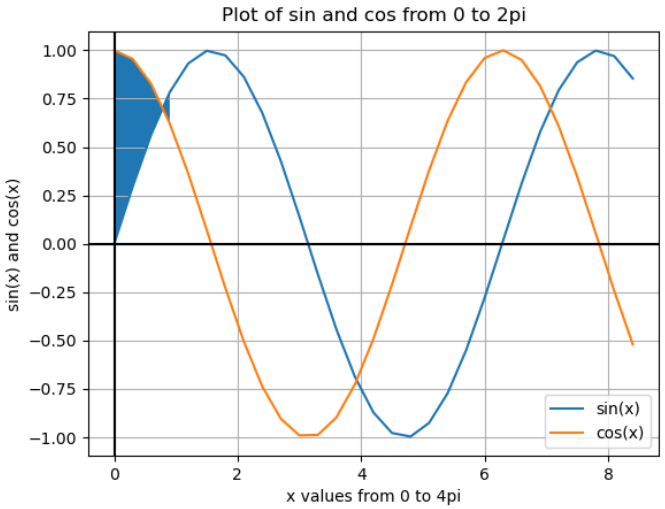
Contents

I. Problem

The Area bounded by the Y-axis,Y = Cos(x) and X = Sin(x), When $0 \leq x \leq \pi/2$ is :
A) $2(\sqrt{2}-1)$
B) $\sqrt{2}-1$
C) $\sqrt{2}+1$
D) $\sqrt{2}$

II. Figure



III. Solution

As we can see from the figure that , the area bounded by y axis between the limit 0 to $\pi/4$ is only by the positive part of the cosine graph , And that too between 0 to $\pi/4$.
i.e the BLUE shaded region.
So, we can further reduce the limits from $0 \leq x \leq \pi/2$ to $0 \leq x \leq \pi/4$. So Now The area bounded by the Y - axis in the given problem can be found by :

$$A = \int_0^{\pi/4} \cos x \, dx - \int_0^{\pi/4} \sin x \, dx \tag{1}$$

which can be reduced as :

$$A = \int_0^{\pi/4} (\cos x - \sin x) \, dx \tag{2}$$

$$A = (\cos \pi/4 + \sin \pi/4) - (\cos 0 + \sin 0) \tag{3}$$

$$A = (\frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}}) - (1+0) \tag{4}$$

$$A = (\frac{2}{\sqrt{2}} - 1) \tag{5}$$

$$A = \sqrt{2} - 1 \tag{6}$$

So, the area bounded by Y-axis is $\sqrt{2}-1$.
So, we can conclude that option B is the correct answer.

IV. Code Link

https://github.com/aadrshptel/Fwc_module1/tree/main/Assignments/Matrix%20assignments/Conics/codes

Execute the code by using the command
python3 circle.py