9-9.2-41

EE24BTECH11022 - Eshan Sharma

Question:
Area of the region in the first quadrant enclosed by the $x-axis$, the line $y=x$ and the circle $x^2+y^2=32$ is

Solution:

Symbol	Value	Description
C	$x^2+y^2=32$	Circle
L	$y=x$	Line

TABLE 0: Variables Used

The given circle **C** can be expressed with parameters

$$\mathbf{V}=\begin{pmatrix}1 & 0\\ 0 & 1\end{pmatrix}, \mathbf{u}=0, f=-32 \tag{0.1}$$

The given line **L** has parameters

$$\mathbf{h}=\begin{pmatrix}1\\ -1\end{pmatrix} \tag{0.2}$$

Substituting the parameters yields us the intersection points as

$$\mathbf{A}=\begin{pmatrix}4\\ 4\end{pmatrix} \text{ and } \mathbf{B}=\begin{pmatrix}4\sqrt{2}\\ 0\end{pmatrix} \tag{0.3}$$

From the given figure, the desired area is

$$\int_0^4 x\,dx+\int_4^{4\sqrt{2}}\sqrt{32-x^2}\,dx=4\pi \text{ square units} \tag{0.4}$$

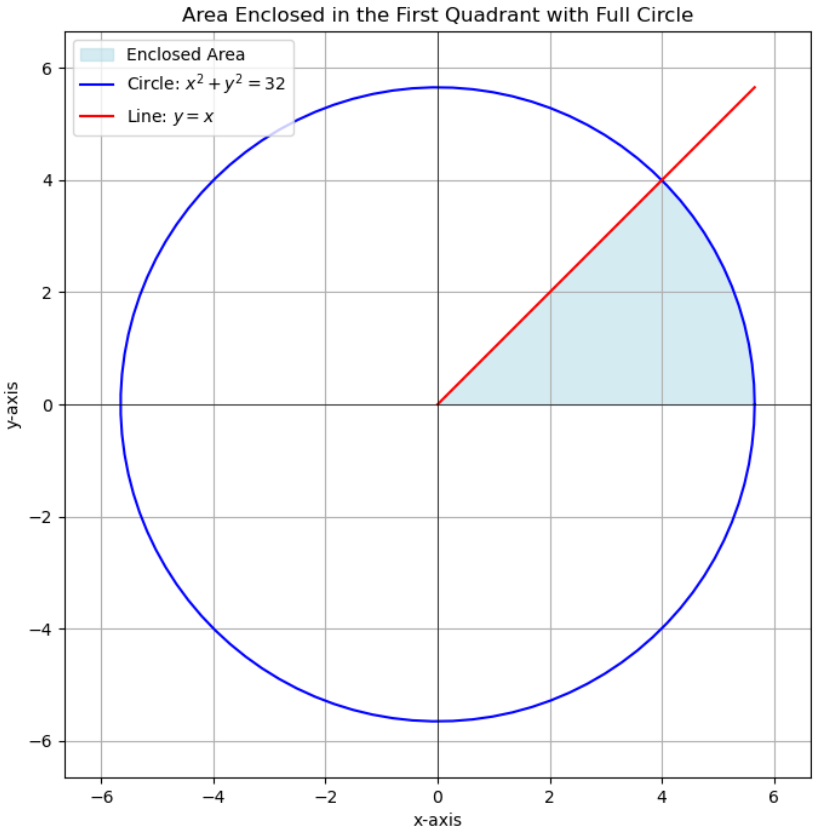

Fig. 0.1: plot of area enclosed