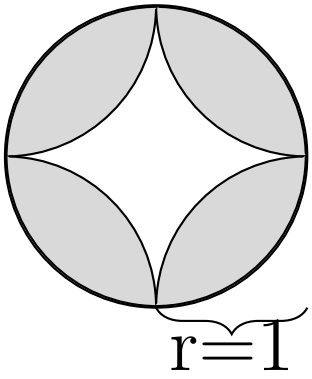
Problem 22

The following figure is constructed by inscribing 4 quarter circles of radius 1 inside of a unit circle. Find the area of the shaded region.



Answer

$\boxed{2\left(\pi - 2\right)}$

Explanation

Construct the square which bisects each "leaf" of the shaded region. The region outside of the square and inside of the circle would hence be $\frac{1}{2}$ the area of the shaded region.

Since the radius of the circle is 1, the side of the constructed square is $\sqrt{2}$. Thus, the area of the region outside of the square and inside the circle is:

$A_{\text{circle}} - A_{\text{square}} = \pi(1)^2 - (\sqrt{2})^2 = \pi - 2$

Hence the area of the shaded region is $2\left(\pi - 2\right)$