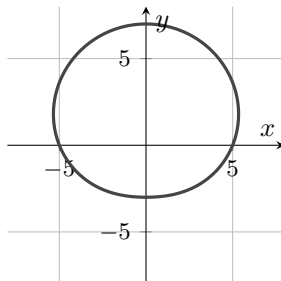


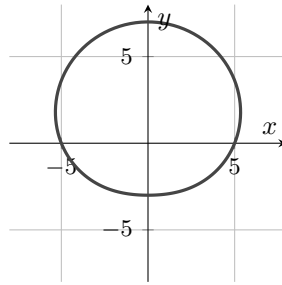
Question 7

Problem

A radar beam reaches distance $r = 5 + 2 \sin \theta$. Find the area swept while $0 \leq \theta \leq \pi$.



Question 7 – Solution



Solution

1. Determine an interval of angles that sweeps out the requested region exactly once, using symmetry when it simplifies the work.
2. For a polar boundary $r = f(\theta)$, use

$$A = \frac{1}{2} \int_a^b r^2 d\theta.$$

For a region between two curves, subtract the inner squared radius from the outer squared radius before integrating.

3. $A = \frac{1}{2} \int_0^\pi (5 + 2 \sin \theta)^2 d\theta = \boxed{27\pi/2 + 20}.$