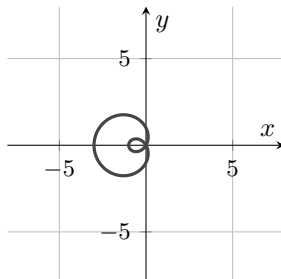
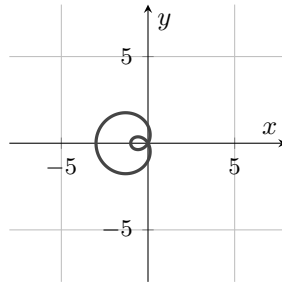


Question 3**Problem**

Find the area of the inner loop of $r = 1 - 2 \cos \theta$.



Question 3 – 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. The loop is traced for $-\pi/3 \leq \theta \leq \pi/3$.
4. Hence $A = \frac{1}{2} \int_{-\pi/3}^{\pi/3} (1 - 2 \cos \theta)^2 d\theta = \boxed{\pi - 3\sqrt{3}/2}$.