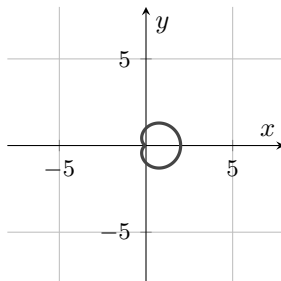
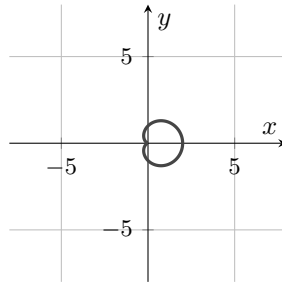


Question 1**Problem**

Find the area enclosed by the cardioid $r = 1 + \cos \theta$.



Question 1 – 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. $A = \frac{1}{2} \int_0^{2\pi} (1 + \cos \theta)^2 d\theta = \boxed{3\pi/2}.$