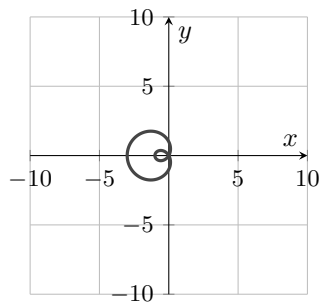
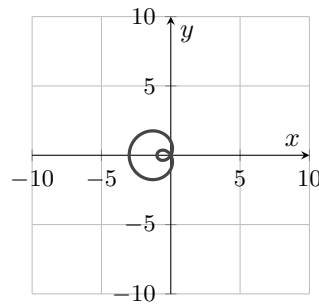


Question 6**Problem**

Sketch mentally $r = 1 - 2 \cos \theta$. Why does it have an inner loop?



Question 6 – Solution

**Solution**

1. Use the polar–Cartesian relationships

$$x = r \cos \theta, \quad y = r \sin \theta, \quad r^2 = x^2 + y^2.$$

Equivalent polar coordinates satisfy

$$(r, \theta) = (r, \theta + 2k\pi) = (-r, \theta + (2k + 1)\pi).$$

2. Apply the identity that matches the requested conversion, symmetry test, or intersection, and then check the resulting point or curve in the original polar equation.
3. The radius becomes negative when $\cos \theta > 1/2$, i.e. near $\theta = 0$.
4. Negative radii plot in the opposite direction, producing the inner loop.