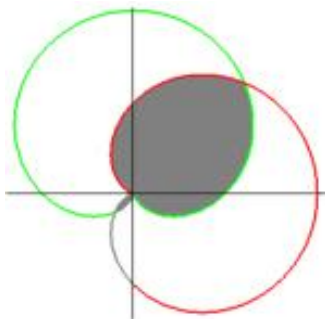


Q-2) Find the area of the region common to the cardioids $r = 1 + \sin \theta$ and $r = 1 + \cos \theta$.

Solution: The two cardioids intersect as follows:



The common area can be found as:

$$\int_{-3\pi/4}^{\pi/4} \int_0^{1+\sin\theta} r \, dr d\theta + \int_{\pi/4}^{5\pi/4} \int_0^{1+\cos\theta} r \, dr d\theta = 2\left(\frac{3\pi}{4} - \sqrt{2}\right) \approx 1.88.$$