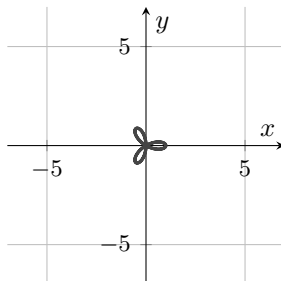
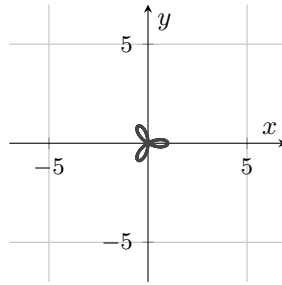


Question 8**Problem**

Explain why integrating the rose $r = \cos 3\theta$ from 0 to 2π overcounts its geometric length.



Question 8 – Solution**Solution**

1. Differentiate the polar radius to obtain $r' = dr/d\theta$ and choose an interval that traces the requested arc exactly once.
2. Use the polar arc-length formula

$$L = \int_a^b \sqrt{r^2 + \left(\frac{dr}{d\theta}\right)^2} d\theta.$$

Simplify the expression under the square root before evaluating or reporting the integral.

3. For odd 3, the full curve is completed on $0 \leq \theta \leq \pi$; the next π retraces it because negative radius duplicates opposite points.
4. The 0 to 2π integral counts every petal twice.