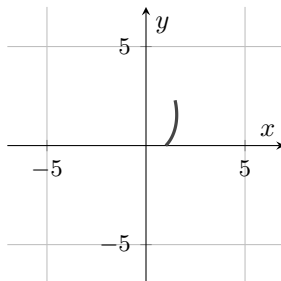
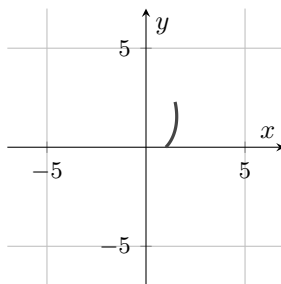


Question 7**Problem**

Find the length of $r = e^\theta$, $0 \leq \theta \leq \ln 2$.



Question 7 – 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. Since $r' = r$, speed is $\sqrt{2}e^\theta$.
4. Thus $L = \sqrt{2}[e^\theta]_0^{\ln 2} = \boxed{\sqrt{2}}$.