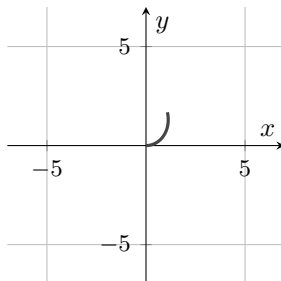
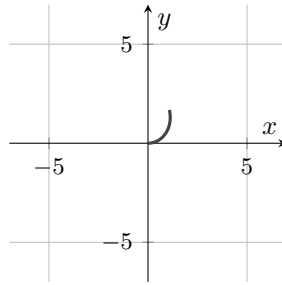


Question 3**Problem**

Find the length of the spiral $r = 2\theta$, $0 \leq \theta \leq 1$.



Question 3 – 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. $L = 2 \int_0^1 \sqrt{1 + \theta^2} d\theta = \boxed{\sqrt{2} + \operatorname{arsinh} 1}.$