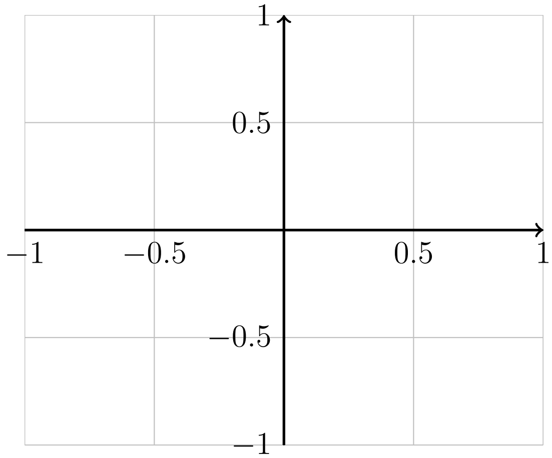
1 Graphing in Polar Coordinates

1. Use the function $r = \cos(\frac{1}{\theta})$ to graph the following:



(a) When $\theta = \frac{2}{\pi}$, $r =$

(b) When $\theta = \frac{4}{\pi}$, $r =$

(c) When $\theta = \frac{6}{\pi}$, $r =$

(d) When $\theta = \pi$, $r =$

(e) When $\theta = 2\pi$, $r =$

(f) the arc of the polar function where $\frac{2}{\pi} \leq \theta \leq 2\pi$

2. Use the function $r = \frac{1}{\theta}$ to graph the following:

(a) When $\theta = \frac{1}{10}$, $r =$

(b) When $\theta = \frac{\pi}{6}$, $r =$

(c) When $\theta = \frac{\pi}{4}$, $r =$

(d) When $\theta = \frac{\pi}{3}$, $r =$

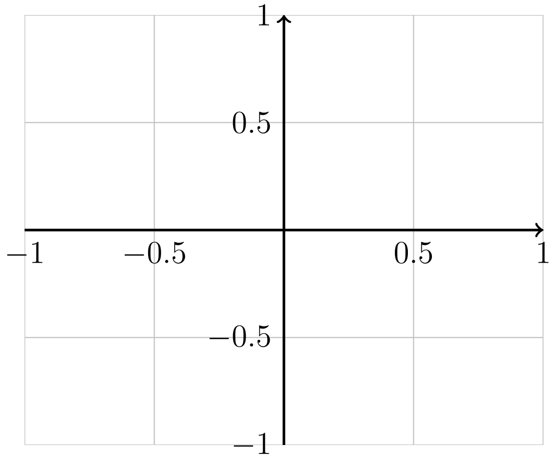
(e) When $\theta = \pi$, $r =$

(f) When $\theta = 2\pi$, $r =$

(g) the arc of the polar function where $\frac{1}{10} \leq \theta \leq 2\pi$.

2 Identifying Areas

1. Graph the function $r_1 = \cos(5\theta)$.



2. Find all values of θ for which $r_1 = 0$. What bounds could you use for θ to set up an integral that will give you the area of 1 petal?

   Is r_1 positive or negative on this region?

3. Suppose you want to find the area inside the petals, but outside the circle $r_2 = \frac{1}{2}$. Find all values of θ for which $r_1 = \frac{1}{2}$.

   Add the circle $r_2 = \frac{1}{2}$ to the graph above. Then shade in the area you are interested in finding.

   What bounds could you use to set up an integral that will give you the area?

3 Calculating Areas

1. Set up and evaluate the integral that will give you the area swept out by $r = \frac{1}{\theta}$, with $\frac{1}{10} \leq \theta \leq 2\pi$.

2. Set up, but do not evaluate, the integral that will give you the area inside $r = \cos(3\theta)$ and outside the circle $r = \frac{1}{2}$.

3. Use a calculator to find $\frac{1}{2}\int_{-\pi/6}^{\pi/6} \cos^2(3\theta)d\theta$ and $\frac{1}{2}\int_{\pi/6}^{\pi/2} \cos^2(3\theta)d\theta$. What do these integrals represent? Explain why you get the values you do.

4 Calculating Arclength

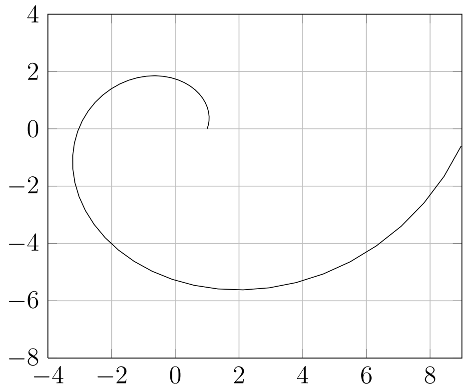
1. Set up, but do not evaluate, the integral that will give you arclength of $r = \frac{1}{\theta}$, with $\frac{1}{10} \leq \theta \leq 2\pi$.

2. Find the value of the previous integral using a calculator.

3. Set up and simplify, but do not evaluate, the integral that will give you the area swept out by $r = \cos(\theta)$, with $-\frac{\pi}{2} \leq \theta \leq \frac{\pi}{2}$.

4. Use a calculator to find $\int_{-\pi/2}^{\pi/2} \sqrt{4\cos^2(\theta)\sin^2(\theta)+1}\,d\theta$, $\int_{\pi/2}^{3\pi/2} \sqrt{4\cos^2(\theta)\sin^2(\theta)+1}\,d\theta$, and $\int_0^{2\pi} \sqrt{4\cos^2(\theta)\sin^2(\theta)+1}\,d\theta$. Interpret the results.

5. Find the arclength of the following curve, from $t = 0$ to $t = \ln 6$.



$$x(t) = e^t \cos(\sqrt{8}t)$$
$$y(t) = e^t \sin(\sqrt{8}t)$$