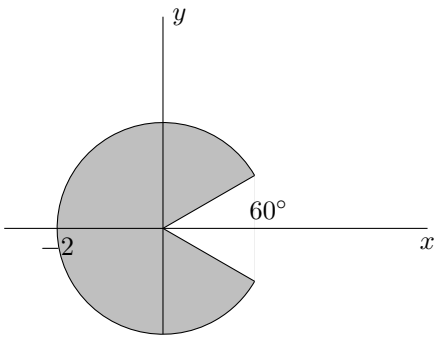
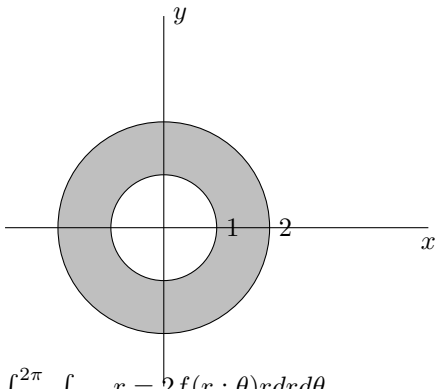
Polar Integrals

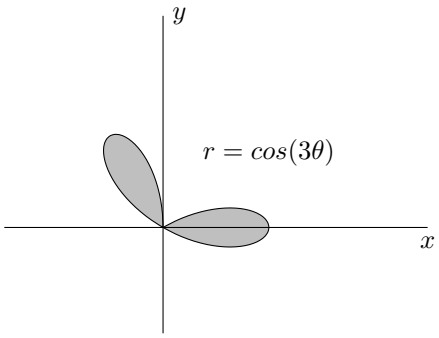
0.1. **Setting up Polar Integrals.**



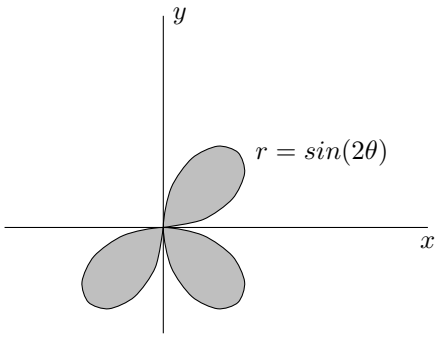
$\int_{\theta=\pi/6}^{11\pi/7}\int_{r=0} r = 2f(r:\theta)rdrd\theta$



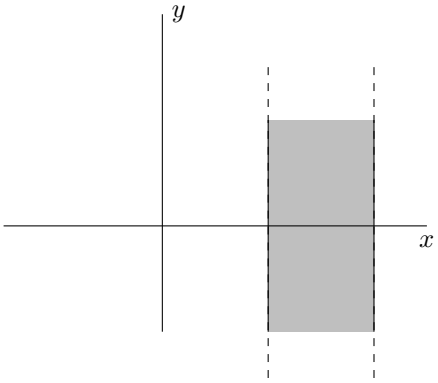
$\int_{\theta=0}^{2\pi}\int_{r=1} r = 2f(r:\theta)rdrd\theta$



$\int_{\theta=-\pi/6}^{\pi/6}\int_{r=0} r = \cos(3\theta)f(r:\theta)rdrd\theta$
$+\int_{\theta=\pi/2}^{5\pi/6}\int_{r=0} r = \cos(3\theta)f(r:\theta)rdrd\theta$



$\int_{\theta=0}^{\pi/4}\int_{r=0} r = \sin(2\theta)f(r:\theta)rdrd\theta + \int_{\theta=\pi}^{3\pi/2}\int_{r=0}^{r=\sin(2\theta)} f(r:\theta)rdrd\theta$
$+\int_{\theta=3\pi/2}^{2\pi}\int_{r=0}^{r=-\sin(2\theta)} f(r:\theta)rdr$



$(5,3)$

0.2. Prove that the volume of a cone is $\pi/3r^2h$.

0.3. I am throwing darts at a dartboard of radius 1. The amount of points that I get from a dart that lands at (r,θ) is 1-r. This means I get 1 point if the dart lands in the center, and 0 points if the dart lands at the boundary.

- Assuming that I am equally likely to throw at any angle, or any radius, What is the predicted score of throwing 100 darts?
- Assuming that I am equally likely to hit any point on the dart board, what is my predicted score from throwing 100 darts?

- What is the difference between the 2 above statements, and how do they relate to polar integration?