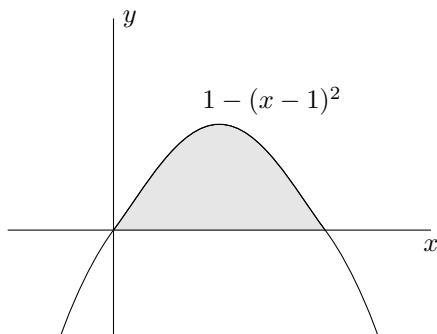
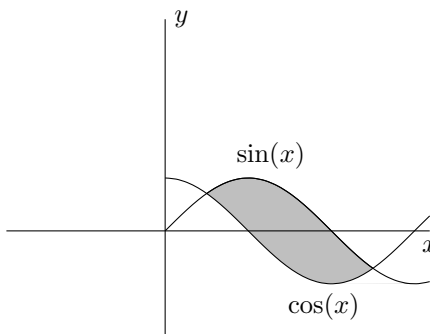


# DOUBLE INTEGRALS

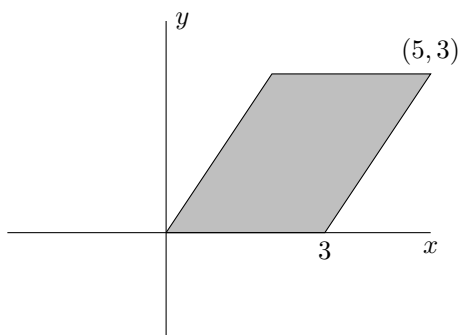
**Set up some Double Integrals.** Write down integrals, which if compute, would find the volume under a function  $f(x, y)$  over the shaded region.



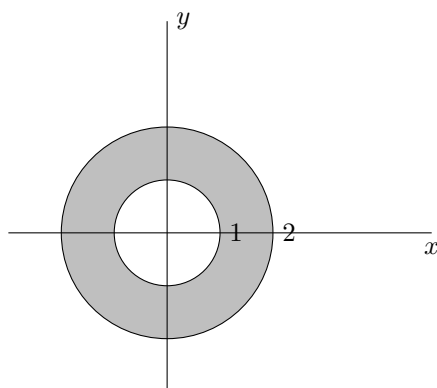
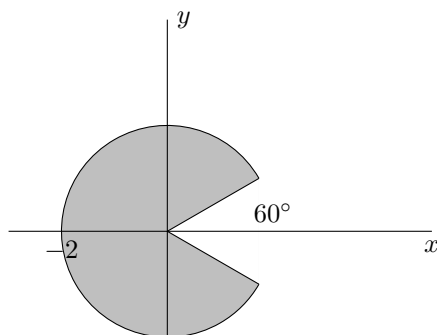
$$\int_{x=0}^1 \int_{y=0}^{1-(x-1)^2} f(x, y) dy dx$$

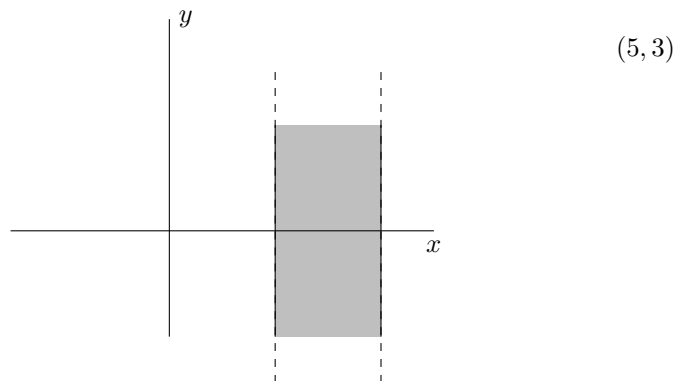


$$\int_{x=\pi/4}^{5\pi/4} \int_{y=\cos x}^{\sin x} f(x, y) dy dx$$



$$\int_{y=0}^3 \int_{x=2/3y}^{2/3y+3} f(x, y) dx dy$$





**Integration.** Compute the volume of a sphere by using a double integral for the region  $x^2 + y^2 \leq 1$  and the function  $\sqrt{1 - x^2 + y^2}$ .

**Average Value.** What is the average value of the function  $x/(1 + xy)$  on the square  $[0, 2] \times [0, 2]$ ?