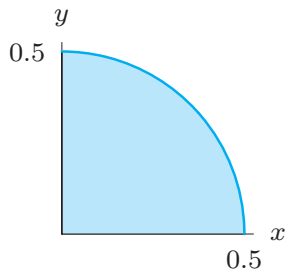
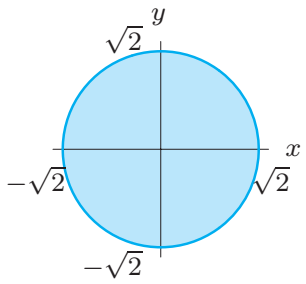
Problem 1: For each shaded region R below, write $\int_R f \, dA$ as an iterated integral in polar coordinates.

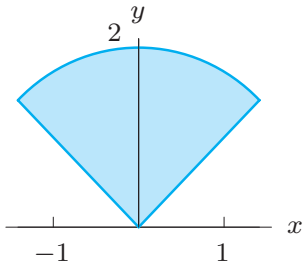
(a)



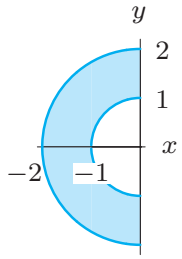
(b)



(c)



(d)



Problem 2: For each part below, sketch the region of integration.

(a) $\displaystyle\int_0^4 \int_{-\pi/2}^{\pi/2} f(r,\theta)\ r\ d\theta\ dr$

(b) $\displaystyle\int_0^{\pi/4} \int_0^{1/\cos\theta} f(r,\theta)\ r\ dr\ d\theta$

(c) $\displaystyle\int_{\pi/4}^{\pi/2} \int_0^{2/\sin\theta} f(r,\theta)\ r\ dr\ d\theta$

Problem 3: Evaluate

$$\int_R \sqrt{x^2+y^2}\, dA$$

where R is $4 \leq x^2 + y^2 \leq 9$.

Problem 4: Evaluate

$$\int_R \sin\left(x^2+y^2\right)\, dA$$

where R is the disk of radius 2 centered at the origin.

Problem 5: Convert the iterated integral to polar coordinates and evaluate

$$\int_{-1}^{0} \int_{-\sqrt{1-x^2}}^{\sqrt{1-x^2}} x\, dy\, dx.$$