- 1. Compute $\int_{0}^{2} \int_{y^{2}}^{2y} (4x y) \, dx \, dy.$
- 2. Compute $\int_0^1 \int_0^x \int_0^{xy} xyz \, dz \, dy \, dx.$
- 3. Let R be the region in the plane bounded by the graphs of $y^2 = 4 + x$ and $y^2 = 4 x$.
 - (a) Sketch R.
 - (b) If f(x, y) is an arbitrary continuous function defined on R, express $\iint_R f(x, y) dA$ as an iterated double integral.
- 4. Compute the following integral:

$$\int_0^1 \int_{\sqrt{y}}^1 \sin(x^3) \, dx \, dy.$$

(*Hint:* First draw the domain of integration. Then reverse the order of integration.)

5. Compute the following integral:

$$\int_0^1 \int_y^{\sqrt{2-y^2}} \sqrt{x^2 + y^2} \, dx \, dy.$$

(*Hint:* First draw the domain of integration. Then use polar coordinates.)

- 6. Compute the area of one leaf of the four leaved rose $r = a \sin(2\theta)$.
- 7. Compute the volume of the region in the first octant that is bounded by the coordinate planes and the plane x + y + z = 3.
- 8. Compute the volume of the finite region Q bounded by the graphs of $z = 9 x^2 y^2$, $x^2 + y^2 = 4$, and z = 0. Use cylindrical coordinates.
- 9. Let Q be the region bounded below by the cone $z^2 = x^2 + y^2$ and above by the sphere of radius $\sqrt{2}$ and center at the origin. Compute the volume of Q using spherical coordinates.