Exercises:

1. Sketch each of the following regions, and write down both iterated integrals that give the area of the region.
   
   (a) \(D = \{(x, y) : 1 \leq x \leq e, 0 \leq y \leq \ln x\}\),
   (b) \(D = \{(x, y) : 0 \leq x \leq 1, 1 - x \leq y \leq 1 - x^2\}\),
   (c) \(D = \{(x, y) : 0 \leq x \leq 2, 1 \leq y \leq e^2\}\).

2. Consider the integral \(\int_0^2 \int_0^{1-x^2} \frac{xe^{2y}}{4-y} dy \, dx\). Sketch the region of integration, reverse the order of integration, and evaluate the integral.

3. Consider the integral \(\int_0^3 \int_0^{\sqrt{x/3}} e^{y^3} dy \, dx\). Sketch the region of integration, reverse the order of integration, and evaluate the integral.

4. Find the volume of the region bounded above by the paraboloid \(z = x^2 + y^2\) and below by the triangle enclosed by the lines \(y = x\), \(x = 0\) and \(x + y = 2\) in the \(xy\)-plane.

5. Change each of the following integrals to an equivalent integral in polar coordinates and evaluate.
   
   (a) \(\int_{-1}^{0} \int_0^{\sqrt{1-x^2}} dy \, dx\).
   (b) \(\int_0^{\ln 2} \int_0^{\sqrt{(\ln 2)^2-y^2}} e^{\sqrt{x^2+y^2}} \, dx \, dy\).

6. Change the following polar integral to an equivalent integral in rectangular coordinates.

\[
\int_{\pi/6}^{\pi/2} \int_1^{\csc \theta} r^2 \cos \theta \, dr \, d\theta
\]