1. Consider the integral
\[ I = \int_0^4 \int_{\sqrt{x}}^2 \sqrt{1 + y^3} \, dy \, dx. \]
(a) Sketch the region \( R \) over which the integration takes place.
(b) Evaluate \( I \) by reversing the order of integration.

2. Set up a triple integral for finding the volume \( V \) of the solid bounded on the top by the plane \( z = y \), on the bottom by the \( xy \) plane and on the sides by the plane \( y = 3x - 2 \) and the parabolic sheet \( y = x^2 \). Do not evaluate the integral.

3. An object occupies the region bounded above by the sphere \( x^2 + y^2 + z^2 = 1 \) and below by the cone \( z = \sqrt{x^2 + y^2} \) and has mass density
\[ \delta(x, y, z) = z \sqrt{x^2 + y^2 + z^2}. \]
(a) Find the mass of the object.
(b) Find the center of gravity of the object.

4. Find the surface area \( S \) of the portion of the surface \( z = xy \) that is inside the cylinder \( x^2 + y^2 = 1 \).

5. Compute \( \int \int_R y \, dA \) where \( R \) is the region bounded by \( y = 3x \), \( x = 3y \) and \( x + y = 4 \) by making the change of variables \( x = 3u + v \), \( y = u + 3v \).