1. i. Write \( \int \int_D f(x, y) \, dA \) as an iterated integral with the integration in \( x \) done first when \( D \) is the domain bounded by \( 2x + 3y = -12 \) and the coordinate axes.

ii. Write \( \int \int_D f(x, y) \, dA \) as an iterated integral in polar coordinates when \( D \) is the set in the first quadrant bounded by \( x^2 + y^2 = 4 \), \( x^2 + y^2 = 1 \), the line \( x = y \) and the \( y \)-axis.

2. Calculate the double integral of \( f(x, y) = \frac{\sin y}{y} \) over the set within the horizontal strip \( 1 \leq y \leq 2 \), bounded by the curves \( y = x \) and \( y = 2013x \).

3. Write \( \int \int \int_W f(x, y, z) \, dV \) as an iterated integral when \( W \) is the region in space bounded by the vertical planes \( x = 0 \), \( x = y \), \( y = 3x - 1 \), and the surfaces \( z = 2x^2 + 4y^2 \) and \( z = x^2 + y^2 \).

4. Describe the domain of integration of the following integral

\[
\int_{-2}^{2} \int_{-\sqrt{4-x^2}}^{\sqrt{4-x^2}} \int_{1}^{\sqrt{5-x^2-y^2}} f(x, y, z) \, dy \, dx \, dz
\]

5. Sketch the region \( D \) indicated and integrate over \( D \) (it might be easier to use non-cartesian coordinates).

   i. \( f(x, y) = y(x^2 + y^2)^3; \ y \geq 0, \ x^2 + y^2 \leq 1 \).

   ii. \( f(x, y) = y(x^2 + y^2)^{-1}; \ y \geq \frac{1}{2}, \ x^2 + y^2 \leq 1 \).

   iii. \( f(x, y) = 2e^{x^2+y^2}; \ x^2 + y^2 \leq 2013 \).

6. Compute \( \int \int_D (x + y) \, dA \) when \( D \) is the triangle with vertices \((1, 1), (2, 4), \) and \((3, -1)\).

   \textit{Hint:} It might be easier to make a change of variables \( x = au + cv + p, \ y = bu + dv + q \) so that in the \((u, v)\) coordinate system the vertices of the triangle are \((0, 0), (1, 0) \) and \((0, 1)\).

7. Find a mapping \( G \) that transforms the disk \( u^2 + v^2 \leq 1 \) onto the interior of the ellipse \( \left( \frac{x}{a} \right)^2 + \left( \frac{y}{b} \right)^2 \leq 1 \). Then use the change of variables formula to prove that the area of the ellipse is \( \pi ab \).

8. Find the total mass\(^1\) of the region bounded by \( y = 4 - x, \ x = 0, \ y = 0 \) if the mass density inside the region is \( \rho(x, y) = xy \).

\(^1\text{The mass of a region } R \text{ with mass density function } \rho(x, y) \text{ is the integral over } R \text{ of the mass density function.}\)