1. Suppose $\Omega$ is the portion of the first quadrant bounded by $y = \sqrt{4 - x^2}$ and $y = \sqrt{1 - x^2}$. Evaluate
\[
\int \int_{\Omega} \frac{1}{\sqrt{x^2 + y^2}} dA
\]

2. Evaluate
\[
\int_{\pi/2}^{\pi/2} \int_{\pi/2}^{\pi/2} \frac{\sin(x)}{x} dxdy
\]

3. Integrating the vector fields along the paths indicated, which of these lines integrals is 0. Explain why.

![Paths](image)

(a) (b) (c)

4. Evaluate $\int_C 2xdx - 3y^2dy$ where $C$ is the portion of the circle $x^2 + y^2 = 9$ in the first quadrant, oriented counterclockwise.

5. Let $S$ be the part of the paraboloid $z = x^2 + y^2$ with positive $x$-coordinate and below the plane $z = 2$. For $\mathbf{F} = (x, y, z)$, evaluate $\int \int_S \mathbf{F} \cdot d\mathbf{S}$, where $S$ is oriented with upward-pointing normals.

6. Let $\mathbf{F} = (0, f_1(x), f_2(x))$ and let $S$ be the surface of revolution obtained by revolving the curve $y = g(x) > 0$ around the $x$-axis for $a \leq x \leq b$.
   (a) Find a parameterization for $S$.
   (b) Find the outward-pointing normal vector.
   (c) Show $\int \int_S \mathbf{F} \cdot d\mathbf{S} = 0$.

7. Evaluate the line integral $\int_C -2ydx + (\arctan(y^3 - y^2) + x)dy$, where $C$ is the path consisting of the line segments shown below.