1. Use the method of Lagrange multipliers to find the global maximum and minimum of the scalar field \( f(x, y) = 2x^2 + 3y^2 \) on the unit disc.

2. Compute the volume of the solid enclosed by the surfaces \( z = 1 - x^2 - y^2 \) and \( z = 0 \).

3. Find the scalar potential for the vector field \( F = [3x^2, z^2/y, 2z \ln y] \) or show that such a potential doesn’t exist.

4. Integrate \( \omega = y \, dx - x \, dy \) around the unit circle counterclockwise. Compute the same integral using Green’s theorem.

5. Compute the flux of \( F = [2x, 3y, 0] \) through the surface \( x^2 + y^2 = 1, -1 \leq z \leq 1 \) oriented with the normal away from the \( z \) axis both directly and also using the divergence theorem.