Exercise 1

Write \( \iiint_D f(x, y, z) \, dV \) as iterated integral in cylindrical coordinates without evaluating (i.e. write it as iterated integral of a function in \( r, \theta, z \) and set up the limits):

(i) \( f(x, y, z) = 5 \), \( D \) is the cylinder \( x^2 + y^2 < 1 \), \(-1 \leq z \leq 1\);
(ii) \( f(x, y, z) = x^2 + y^2 \), \( D \) is the circular cylinder whose base is the circle \((x-1)^2 + y^2 = 1\) in the \( xy \)-plane and whose top lies in the plane \( z = 2 + y \).

Exercise 2

Set up the iterated integral with correct limits that calculates the volume of the given solid \( D \) in spherical coordinates \( \rho, \varphi, \theta \) without evaluating:

(i) \( D \) is the solid between the spheres \( \rho = 1 \) and \( \rho = 2 \);
(ii) \( D \) is the solid bounded by the sphere \( \rho = 1 \) in the half-space \( z \geq 0 \);
(iii) \( D \) is the solid bounded by the sphere \( \rho = 1 \) in the half-space \( y \geq 0 \);
(iv) \( D \) is the solid bounded below by the \( xy \)-plane, on the sides by the sphere \( \rho = 1 \), and above by the cone \( \varphi = \pi/4 \).