8. **(10 points)** Compute the volume of the solid in the first octant bounded by
\[2x + 2y + z = 4.\]

8. Find the volume of the solid under the surface \(z - xy = 1\) and above the bounded region in the upper half-plane enclosed by \(x = y^2, y = 0, \) and \(x = 4.\)

**Problem 8.** (8 points) Let \(C\) be the portion of the cylinder \(x^2 + y^2 \leq 1\) lying in the first octant \((x \geq 0, y \geq 0, z \geq 0)\) and below the plane \(z = 1.\) Set up a triple integral in cylindrical coordinates which gives the moment of inertia of \(C\) about the \(z\)-axis; assume the density to be \(\rho = 1.\)

(Give integrand and limits of integration, but do not evaluate.)

**Problem 9.** (10 points)

A solid sphere \(S\) of radius \(a\) is placed above the \(xy\)-plane so it is tangent at the origin and its diameter lies along the \(z\)-axis. Set up a triple integral in spherical coordinates which gives the volume of the portion of the sphere \(S\) lying above the plane \(z = a.\) (Give integrand and limits of integration, but do not evaluate.)

15. Find the volume of the solid that lies under the plane \(x - 2y + z = 4\) and above the square \(R = [-1, 1] \times [0, 2].\)

Problems 13-15 concern the following question

Let \(D\) denote the three-dimensional region inside the cylinder \(x^2 + y^2 = 4,\) outside the cylinder \(x^2 + y^2 = 1,\) above the plane \(z = -1\) and below the sphere of radius 3 centered at the origin. See the figure below.

We would like to compute the volume of the region \(D\) using a triple integral in cylindrical coordinates:

\[
\int_{\phi=0}^{\pi} \int_{r=C}^{D} \int_{z=E}^{F} r \, dz \, dr \, d\phi.
\]

In the following problems, determine the correct limits of integration.

13. Determine what \(A\) and \(B\) should be.

(a) \(A = -\pi/2, \, B = 2\pi\)
(b) \(A = 0, \, B = 2\pi\)
(c) \(A = 0, \, B = \pi\)
(d) \(A = -\pi/2, \, B = \pi/2\)

14. Determine what \(C\) and \(D\) should be.

(a) \(C = 0, \, D = 4\)
(b) \(C = 0, \, D = 2\)
(c) \(C = 1, \, D = 4\)
(d) \(C = 1, \, D = 2\)

15. Determine what \(E\) and \(F\) should be.

(a) \(E = -1, \, F = 3\)
(b) \(E = 0, \, F = 3\)
(c) \(E = -1, \, F = \sqrt{9 - r^2}\)
(d) \(E = 0, \, F = \sqrt{9 - r^2}\)