1. (8 points) **Example:** Let T be the tetrahedron with vertices $O(0,0,0)$, $A(0,0,6)$, $B(4,0,0)$, $C(0,4,0)$ *(Note that the plane containing A, B, C has the equation $3x + 3y + 2z = 12$.)*

   (a) Express T as a solid region of type 1.

   (b) Express $\iiint_T f(x,y,z)\, dV$ as an iterated integral.

2. (8 points) Change the order of integration in

$$\int_{x=0}^{2} \int_{y=x}^{2} \int_{z=0}^{y} (x + y + z)\, dz\, dy\, dx$$

   so that the order becomes $dz\, dx\, dy$, and sketch the projection of the region on the xy–plane.

3. (8 points) Express $\iiint_E (x+z)\,dV$ in cylindrical coordinates, where E lies *above* the cone $z = \sqrt{x^2+y^2}$ and *below* the plane $z = 3$ in the first octant. **Do not evaluate.**

4. (8 points) Evaluate $\iiint_E (x^2+y^2)\,dV$, where E is the solid under the paraboloid $z = 4 - x^2 - y^2$ and above the xy–plane.

5. (6 points) Set up (but do not evaluate) a triple integral in cylindrical coordinates for the volume of the solid bounded by the cone $z = \sqrt{x^2 + y^2}$ and the plane $z = 2$.

6. (8 points) Find the mass of the solid hemisphere $x^2 + y^2 + z^2 \leq 9$, $z \geq 0$, with density $\rho(x, y, z) = z$.

7. (8 points) Express the volume of the region *inside* the sphere $x^2 + y^2 + z^2 = 16$ but *outside* the cylinder $x^2 + y^2 = 4$ as a triple integral in spherical coordinates. **Do not evaluate.**

8. (3 points) Let $\mathbf{F}(x, y) = \langle 3x^2y - y^3,\ x^3 - 3xy^2 \rangle$. Determine whether $\mathbf{F}$ is conservative on $\mathbb{R}^2$.