1. Sketch the region of integration and write an equivalent double integral with the order of integration reversed and evaluate the integral.

\[
\int_0^1 \int_{\sqrt[3]{x}}^1 e^y \, dy \, dx
\]

2. Find the volume of the solid cut from the first octant by the surface \( z = 4 - x^2 - y^2 \).
3. Find the centroid of the region between the $x$–axis and arch $y = \sin x$, $0 \leq x \leq \pi$.

4. Find the center of mass and moment of inertia and radius of gyration about the $y$–axis of a thin plate bounded by the line $y = 1$ and the parabola $y = x^2$ if the density is $\delta(x, y) = y + 1$.
5. Change this Cartesian integral into an equivalent polar integral. Then evaluate the polar integral.

\[
\int_0^2 \int_0^{\sqrt{9-(x-1)^2}} \frac{x+y}{x^2+y^2} \, dy \, dx
\]

6. Find the area of a region that lies inside the cardioid \( r = 1 + \cos \theta \) and outside the circle \( r = 1 \).

Continued on the next page.
7. Evaluate $\int_0^1 \int_{-3x}^{3-3x} \int_y^{3-x-y} dz \ dy \ dx$.

8. Evaluate $\int_{-1}^{1} \int_{-1}^{1} \int_{-1}^{1} (x + y + z) dy \ dx \ dz$. 