Problem 1 (10 points):
Compute the volume under the graph of $z = xy$ above the domain $D = \{(x, y) : x \leq 0, y \leq 0, x^2 + y^2 \leq 4\}$.

\[
\int_\phi^{3\pi/2} \int_\pi^2 \int_0^2 r^2 \cos \theta \sin \phi \, dr \, d\theta \, du
= \int_0^{3\pi/2} \cos \theta \cdot \sin \phi \cdot \frac{r^3}{4} \bigg|_0^2 \, d\theta
= \frac{3\pi}{4} \int_0^{3\pi/2} u \, du = 2
\]

Problem 2 (10 points):
Compute the integral:

\[
\iiint_D z dV
\]

in the region $D$ bounded by $x^2 + y^2 = 1$, $x^2 + y^2 + z^2 = 2$ and $z = 0$.

\[
= \int_{\phi_0}^{2\pi} \int_{\theta_0}^{\pi/2} \int_{\rho_0}^{2\rho_0 \sin \phi} \rho^3 \sin \phi \, d\rho \, d\theta \, d\phi

= \int_{\phi_0}^{2\pi} \int_{\theta_0}^{\pi/2} \rho^4 \sin \phi \, d\rho \, d\theta

= \frac{3\pi}{4}
\]