Cylindrical Triple Integrals

1. Compute $\iiint_E yz \, dV$, where E is the region above $z = 0$, below $z = y$, and inside $x^2 + y^2 = 4$.

2. Find the volume contained above $z = x^2 + y^2$ and below $z = \sqrt{x^2 + y^2}$.

3. Compute $\iiint_E y^2 z^2 \, dV$, where E is the region bounded by $x = 1 - y^2 - z^2$ and $x = 0$.

   Hint: You might be able to make use of the fact that $\int \cos^2 t \sin^2 t \, dt = \frac{1}{32}(4t - \sin(4t)) + C$

4. Sketch the solid whose volume is given by the iterated integral.
   (a) $\int_{\pi/2}^{3\pi/2} \int_0^4 \int_{-1}^2 r \, dz \, dr \, d\theta$
   (b) $\int_{-\pi/2}^{\pi/2} \int_0^2 \int_{r^2}^4 r \, dz \, dr \, d\theta$
   (c) $\int_0^2 \int_0^{2\pi} \int_0^r r \, dz \, d\theta \, dr$

Answers

1. $\frac{64}{15}$
2. $\frac{\pi}{6}$
3. $\frac{\pi}{96}$