1. Calculo en el primer octante

   a) D_1

   $\begin{cases} 0 \le r \le 1 \\ 0 \le \theta \le \frac{\pi}{4} \\ 0 \le z \le \sqrt{3} \end{cases}$

   $\int_0^1 (\int_0^{\frac{\pi}{4}} (\int_0^{\sqrt{3}} rdz)d\theta)dr$

   - $\int_0^{\sqrt{3}} rdz =$
     $\sqrt{3}r$
   - $\sqrt{3} \int_0^{\frac{\pi}{4}} rd\theta =$
     $\sqrt{3}\frac{\pi}{4}r$
   - $\sqrt{3}\frac{\pi}{4} \int_0^1 rdr =$
     $\sqrt{3}\frac{\pi}{4}\frac{1}{2} =$
     $\frac{\sqrt{3}\pi}{8}$

   b) D_2

   $\begin{cases} 0 \le r \le \sqrt{4-z^2} \\ 0 \le \theta \le \frac{\pi}{4} \\ \sqrt{3} \le z \le 2 \end{cases}$

   $\int_{\sqrt{3}}^2 (\int_0^{\frac{\pi}{4}} (\int_0^{\sqrt{4-z^2}} rdr)d\theta)dz$

   - $\int_0^{\sqrt{4-z^2}} rdr =$
     $\frac{4-z^2}{2} =$
     $2 - \frac{z^2}{2}$
   - $\int_0^{\frac{\pi}{4}} 2 - \frac{z^2}{2} d\theta$
     $\frac{\pi}{2} - \frac{\pi z^2}{8}$
   - $\int_{\sqrt{3}}^2 \frac{\pi}{2} - \frac{\pi z^2}{8} dz =$
     $\frac{\pi}{2}z - \frac{\pi z^3}{24}\Big|_{\sqrt{3}}^2 =$
     $\pi - \frac{\pi}{3} - \frac{\sqrt{3}\pi}{2} + \frac{\sqrt{3}\pi}{8} =$
     $\frac{2\pi}{3} - \frac{5\sqrt{3}\pi}{8}$

   D en el primer octante es $D_1 + D_2$, y el volumen total es $8 \cdot D$

   $Vol = 8 \cdot (\frac{2\pi}{3} - \frac{\sqrt{3}\pi}{2}) = \frac{16\pi}{3} - 4\sqrt{3}\pi$

2. $\begin{cases} z = x^2 + y^2 \equiv z = r^2 \\ x^2 + y^2 + z^2 = 2 \equiv r^2 + z^2 = 2 \end{cases}$

   $\begin{cases} z = x^2 + y^2 \\ x^2 + y^2 + x^2 + y^2 = 2 \equiv x^2 + y^2 = 1 \\ z = 1 \end{cases}$

   $D = D_1 + D_2$

   a) D_1

   $\begin{cases} 0 \le z \le \sqrt{2-r^2} \\ 0 \le \theta \le \frac{\pi}{4} \\ 0 \le r \le 1 \end{cases}$

   $\int_0^1 (\int_0^{\frac{\pi}{4}} (\int_0^{\sqrt{2-r^2}} rdz)d\theta)dr$

   $\frac{\pi}{4} - \frac{1}{3}\left(2 - r^2\right)^{\frac{3}{2}}\Big|_0^1 =$

   $\frac{\pi}{4}(-\frac{1}{3})$

   b) D_2

   $\begin{cases} 1 \le z \le \sqrt{2} \\ 0 \le \theta \le \frac{\pi}{4} \\ 0 \le r \le \sqrt{2-z^2} \end{cases}$