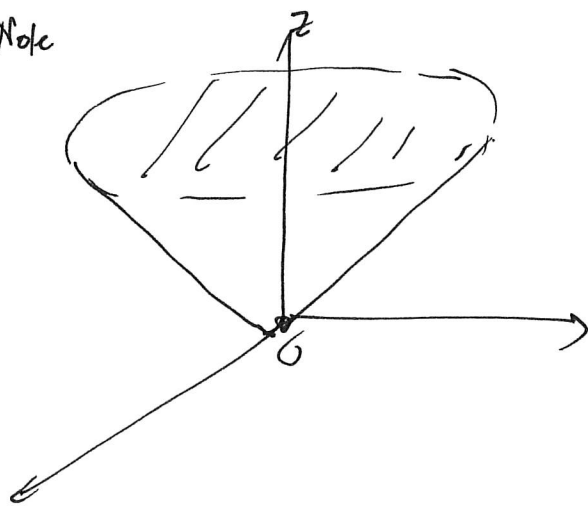


$$18. E = \{(\rho, \theta, \phi) \mid 0 \leq \rho \leq \sec \phi, 0 \leq \theta \leq 2\pi, 0 \leq \phi \leq \pi/4\}$$

Note



$z=1$ at the top of the cone

$$\text{so } 1 = \rho \cos \phi \Rightarrow \rho = \frac{1}{\cos \phi} = \sec \phi$$

$$\text{so } V = \int_0^{\pi/4} \int_0^{2\pi} \int_0^{\sec \phi} \rho^2 \sin \phi \, d\rho \, d\theta \, d\phi = \frac{\pi}{2}$$

$$20. E = \{(\rho, \theta, \phi) \mid 1 \leq \rho \leq 2, \frac{\pi}{2} \leq \theta \leq 2\pi, 0 \leq \phi \leq \frac{\pi}{2}\}$$

$$30. E = \{(\rho, \theta, \phi) \mid 0 \leq \rho \leq 2, 0 \leq \theta \leq 2\pi, \frac{\pi}{4} \leq \phi \leq \frac{\pi}{2}\}$$

$$\text{Ans } \frac{8\sqrt{2}\pi}{3}$$