

$$= \int_{\varphi=0}^{2\pi} \int_{\theta=0}^{\frac{\pi}{4}} \int_{r=0}^{\frac{3}{\cos\theta}} r^3 \sin\theta \, dr \, d\theta \, d\varphi$$

$$= \int_{\varphi=0}^{2\pi} \int_{\theta=0}^{\frac{\pi}{4}} \left. \frac{r^4 \sin\theta}{4} \right|_{r=0}^{\frac{3}{\cos\theta}} d\theta \, d\varphi$$

$$= \int_{\varphi=0}^{2\pi} \int_{\theta=0}^{\frac{\pi}{4}} \frac{81}{4} \frac{1}{\cos^4\theta} \sin\theta \, d\theta \, d\varphi$$

$$= \int_{\varphi=0}^{2\pi} \int_{\theta=0}^{\frac{\pi}{4}} \frac{81}{4} \cos^{-4}\theta \sin\theta \, d\theta \, d\varphi$$

$$= \int_{\varphi=0}^{2\pi} \left. \frac{81(-1)\cos^{-3}\theta}{-3} \right|_{\theta=0}^{\frac{\pi}{4}} d\varphi$$

$$= \int_{\varphi=0}^{2\pi} \left. \frac{27}{4} \frac{1}{\cos^3\theta} \right|_{\theta=0}^{\frac{\pi}{4}} d\varphi$$

$$= \int_{\varphi=0}^{2\pi} \left(\frac{27}{4} \frac{1}{\left(\frac{\sqrt{2}}{2}\right)^3} - \frac{27}{4} \right) d\varphi$$

$$= \int_{\varphi=0}^{2\pi} \frac{27}{4} \left(\frac{8}{2\sqrt{2}} - 1 \right) d\varphi$$

$$= \frac{27}{4} \left(\frac{4}{\sqrt{2}} - 1 \right) \theta \Big|_{\varphi=0}^{2\pi}$$

$$= \frac{27}{4} \left(\frac{4}{\sqrt{2}} - 1 \right) 2\pi$$

$$= \frac{27}{2} \left(\frac{4-\sqrt{2}}{\sqrt{2}} \right) \pi$$