

$$2. \int_{\theta=0}^{\theta=\frac{\pi}{2}} \int_{r=0}^{r=4} (r^2 \cos \theta) dr d\theta$$

$$= \int_{\theta=0}^{\theta=\frac{\pi}{2}} \left[\frac{1}{3} r^3 \cos \theta \right]_{r=0}^{r=4} d\theta$$

$$= \frac{1}{3} \int_{\theta=0}^{\theta=\frac{\pi}{2}} [4^3 \cos \theta - 0^3 \cos \theta] d\theta$$

$$= \frac{1}{3} \cdot 64 \int_{\theta=0}^{\theta=\frac{\pi}{2}} \cos \theta d\theta$$

$$= \frac{64}{3} [\sin \theta]_{\theta=0}^{\theta=\frac{\pi}{2}}$$

$$= \frac{64}{3} [\sin \frac{\pi}{2} - \sin 0]$$

$$= \frac{64}{3} [1 - 0]$$

$$= \left(\frac{64}{3} \right)$$