

$$1. \int_{z=-2}^{z=3} \int_{\theta=0}^{\theta=\frac{\pi}{2}} \int_{r=0}^{r=1} (r^2 \sin \theta) dr d\theta dz$$

$$= \int_{z=-2}^{z=3} \int_{\theta=0}^{\theta=\frac{\pi}{2}} \left[\frac{1}{3} r^3 \sin \theta \right]_{r=0}^{r=1} d\theta dz$$

$$= \frac{1}{3} \int_{z=-2}^{z=3} \int_{\theta=0}^{\theta=\frac{\pi}{2}} \sin \theta [r^3]_{r=0}^{r=1} d\theta dz$$

$$= \frac{1}{3} \int_{z=-2}^{z=3} \int_{\theta=0}^{\theta=\frac{\pi}{2}} \sin \theta [1^3 - 0^3] d\theta dz$$

$$= \frac{1}{3} \int_{z=-2}^{z=3} \left[-\cos \theta \right]_{\theta=0}^{\theta=\frac{\pi}{2}} dz$$

$$= -\frac{1}{3} \int_{z=-2}^{z=3} [\cos \frac{\pi}{2} - \cos 0] dz$$

$$= -\frac{1}{3} \int_{z=-2}^{z=3} [0 - 1] dz$$

$$= -\frac{1}{3}(-1) \int_{z=-2}^{z=3} dz$$

$$= \frac{1}{3} [z]_{z=-2}^{z=3}$$

$$= \frac{1}{3} [3 - (-2)]$$

$$= \left(\frac{5}{3} \right)$$