

$$8. \int_{\theta=0}^{\theta=\frac{\pi}{2}} \int_{r=0}^{r=\sin\theta} (r^5 \cos\theta) dr d\theta$$

$$= \int_{\theta=0}^{\theta=\frac{\pi}{2}} \left[ \frac{1}{6} r^6 \cos\theta \right]_{r=0}^{r=\sin\theta} d\theta$$

$$= \frac{1}{6} \int_{\theta=0}^{\theta=\frac{\pi}{2}} \left[ (\sin\theta)^6 \cos\theta - (0)^6 \cos\theta \right] d\theta$$

$$= \frac{1}{6} \int_{\theta=0}^{\theta=\frac{\pi}{2}} \left[ (\sin\theta)^6 \cos\theta \right] d\theta$$

$u = \sin\theta \quad du = \cos\theta d\theta$

$$= \frac{1}{6} \int_{\theta=0}^{\theta=\frac{\pi}{2}} u^6 du$$

$$= \frac{1}{6} \left[ \frac{1}{7} u^7 \right]_{\theta=0}^{\theta=\frac{\pi}{2}}$$

$$= \frac{1}{42} \left[ (\sin\theta)^7 \right]_{\theta=0}^{\theta=\frac{\pi}{2}}$$

$$= \frac{1}{42} \left[ (\sin\frac{\pi}{2})^7 - (\sin 0)^7 \right]$$

$$= \frac{1}{42} [1^7 - 0^7]$$

$$= \left( \frac{1}{42} \right)$$

