

$$6. \int_{x=0}^{x=\frac{\pi}{2}} \int_{y=0}^{y=2} (y^2 \sin x) dy dx$$

$$= \int_{x=0}^{x=\frac{\pi}{2}} \left[ \frac{1}{3} y^3 \sin x \right]_{y=0}^{y=2} dx$$

$$= \int_{x=0}^{x=\frac{\pi}{2}} \left[ \frac{1}{3} (2)^3 \sin x - \frac{1}{3} (0)^3 \sin x \right] dx$$

$$= \int_{x=0}^{x=\frac{\pi}{2}} \left( \frac{8}{3} \sin x \right) dx$$

$$= \frac{8}{3} \int_{x=0}^{x=\frac{\pi}{2}} \sin x dx$$

$$= \frac{8}{3} \left[ -\cos x \right]_{x=0}^{x=\frac{\pi}{2}}$$

$$= -\frac{8}{3} \left[ \cos x \right]_{x=0}^{x=\frac{\pi}{2}}$$

$$= -\frac{8}{3} \left[ \cos \frac{\pi}{2} - \cos 0 \right]$$

$$= -\frac{8}{3} \left[ 0 - 1 \right]$$

$$= \left( \frac{8}{3} \right)$$

