

$$5] \int_0^{\pi/3} \sin \theta \cos^2 \theta \, d\theta = \int_{\theta=0}^{\theta=\pi/3} -u^2 \, du$$

$$u = \cos \theta$$

$$du = -\sin \theta \, d\theta$$

$$= -\frac{u^3}{3} \Big|_{\theta=0}^{\theta=\pi/3}$$

$$= -\frac{\cos^3(\theta)}{3} \Big|_0^{\pi/3}$$

$$= -\frac{(\cos(\frac{\pi}{3}))^3}{3} - \frac{-(\cos(0))^3}{3}$$

$$= -\frac{1}{3} \left(\frac{1}{2}\right)^3 + \frac{1}{3}(1)^3$$

$$= \frac{1}{3} - \frac{1}{3} \left(\frac{1}{8}\right) = \frac{1}{3} - \frac{1}{24}$$

$$= \frac{8}{24} - \frac{1}{24} = \frac{7}{24}$$