

B/45

$$dm = \rho dV = \rho t 2\pi x r d\theta = 2\pi \rho t r^2 \sin \theta d\theta$$

$$m = 2\pi \rho t r^2 \int_0^{\pi/2} \sin \theta d\theta = 2\pi \rho t r^2$$

$$\begin{aligned} I_{zz} &= \int x^2 dm = 2\pi \rho t r^2 \int_0^{\pi/2} r^2 \sin^3 \theta d\theta \\ &= 2\pi \rho t r^4 \left[-\frac{\cos \theta}{3} (2 + \sin^2 \theta) \right]_0^{\pi/2} \\ &= \frac{4}{3} \pi \rho t r^4 = \frac{2}{3} m r^2 \end{aligned}$$



Also, $I_{xx} = I_{zz} = \frac{2}{3} m r^2$ since each is half that for whole shell of mass $2m$