Rotation of a Fundamental Element of Galactic Volume

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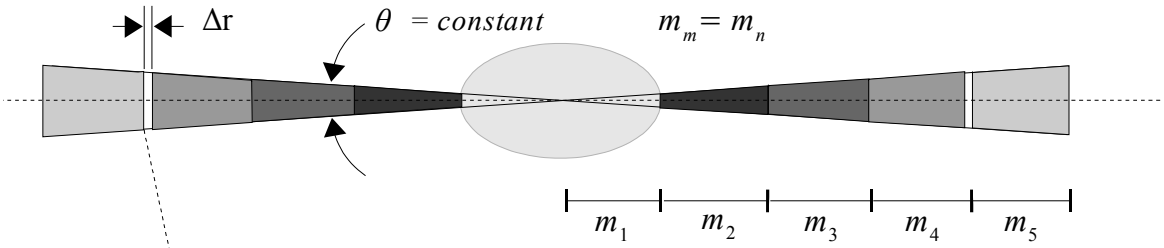

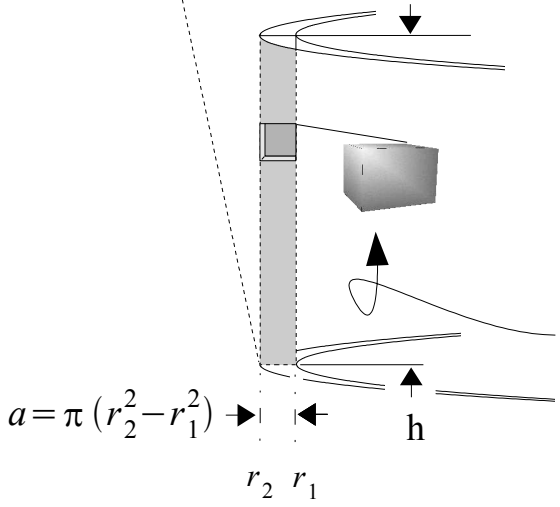

1) $$\frac{dm}{dr} = \omega$$

$$\int_{r_1}^{r_2} \frac{dv}{dr} = \pi (r_2^2 h_2 - r_1^2 h_1), \quad h = r\tan\theta$$

2) $$\frac{dv}{dr} = 3\pi r^2 \tan\theta$$

3) $$\frac{dm}{dv} = \frac{dm}{dr}\left(\frac{dv}{dr}\right)^{-1} = \frac{\omega}{3\pi r^2 \tan\theta}$$

4) *Moment of Inertia of Point Mass:* $$I_P = mr^2$$

5) *Substituting fundamental particle,* $\frac{dm}{dv}$, *for* m_a*:* $$I_P = \left(\frac{\omega}{3\pi r^2 \tan\theta}\right) r^2$$

$$= \frac{\omega}{3\pi \tan\theta}$$

Interestingly, when $\theta = 6.06^\circ$, $\tan\theta = 1/3\pi$, *and :* $$I_P = \omega = \frac{dm}{dr}$$

In any case, if the mass is uniformly distributed across the radius, and the density is inversely proportional to the square of the radius, then the moment of inertia of a fundamental, spinless, mass is also constant with respect to the radius.