

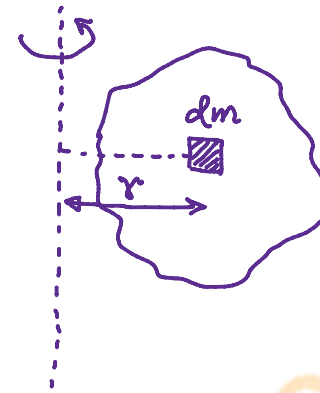
Class XI Moment of Inertia

Friday, October 29, 2021 7:55 PM

Moment of Inertia of a Rigid body:

$$I = m_1 r_1^2 + m_2 r_2^2 + \dots = \sum m_i r_i^2$$

$$\checkmark I = \int r^2 dm \quad \text{--- (1)}$$



Moment of Inertia of a uniform Rod (about an axis passing through its centre and \perp to its length)

λ = mass per unit length

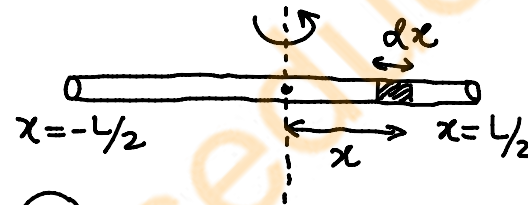
$$\lambda = \frac{M}{L} \quad \text{--- (1)}$$

$$dm = \lambda \cdot dx \Rightarrow dm = \frac{M}{L} \cdot dx \quad \text{--- (2)}$$

$$I = \int_{-L/2}^{L/2} x^2 \left(\frac{M}{L} dx \right)$$

$$I = \frac{M}{L} \int_{-L/2}^{L/2} x^2 dx \Rightarrow I = \frac{M}{L} \left[\frac{x^3}{3} \right]_{-L/2}^{L/2}$$

$$I = \frac{M}{L} \left\{ \frac{(L/2)^3}{3} - \frac{(-L/2)^3}{3} \right\}$$



$$\int x^n dx = \frac{x^{n+1}}{n+1}$$