

LIST OF EQUATIONS → MECHANICS

• Moments of inertia

- Hoop $I_{cm} = MR^2$

- Hollow cylinder $I_{cm} = \frac{1}{2}M(R_1^2 + R_2^2)$

- Solid cylinder $I_{cm} = \frac{1}{2}MR^2$

- Rectangular plate $I_{cm} = \frac{1}{12}M(a^2 + b^2)$

- Long, thin rod; rotated through center $I_{cm} = \frac{1}{12}ML^2$

- Long, thin rod; rotated through end $I = \frac{1}{3}ML^2$

- Solid sphere $I_{cm} = \frac{2}{5}MR^2$

- Thin spherical shell $I_{cm} = \frac{2}{3}MR^2$

- Rotation

- Work $W = \int \tau d\theta$

- Power $P = \tau \omega$

- Net torque $\sum \tau = \frac{dL}{dt}$

- Parallel Axis Theorem

$$I = I_{cm} + MD^2$$

- Escape Velocity

$$v_e = \sqrt{\frac{2GM}{R}}$$

- Kepler's Third Law

$$T^2 = \frac{4\pi^2}{GM} a^3$$

↓
↪ distance

period
↪ mass of object in center

- Acceleration due to gravity

$$a = \frac{GM}{(r+h)^2}$$

- Simple harmonic motion

$$\frac{d^2x}{dt^2} = -\omega^2 x$$

$$\left[\cdot \text{Euler: } e^{i\theta} = \cos\theta + i\sin\theta \right]$$