

20.5: Rotational Kinetic Energy for a Rigid Body Undergoing Fixed Axis Rotation

The rotational kinetic energy for the rigid body, using $\vec{v}_{\text{cm},i} = (r_{\text{cm},i})_{\perp} \omega_{\text{cm}} \hat{\theta}$, simplifies to

$$K_{\text{rot}} = \frac{1}{2} I_{\text{cm}} \omega_{\text{cm}}^2$$

Therefore the total kinetic energy of a translating and rotating rigid body is

$$K_{\text{total}} = K_{\text{trans}} + K_{\text{rot}} = \frac{1}{2} m V_{\text{cm}}^2 + \frac{1}{2} I_{\text{cm}} \omega_{\text{cm}}^2 \quad (20.5.1)$$

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