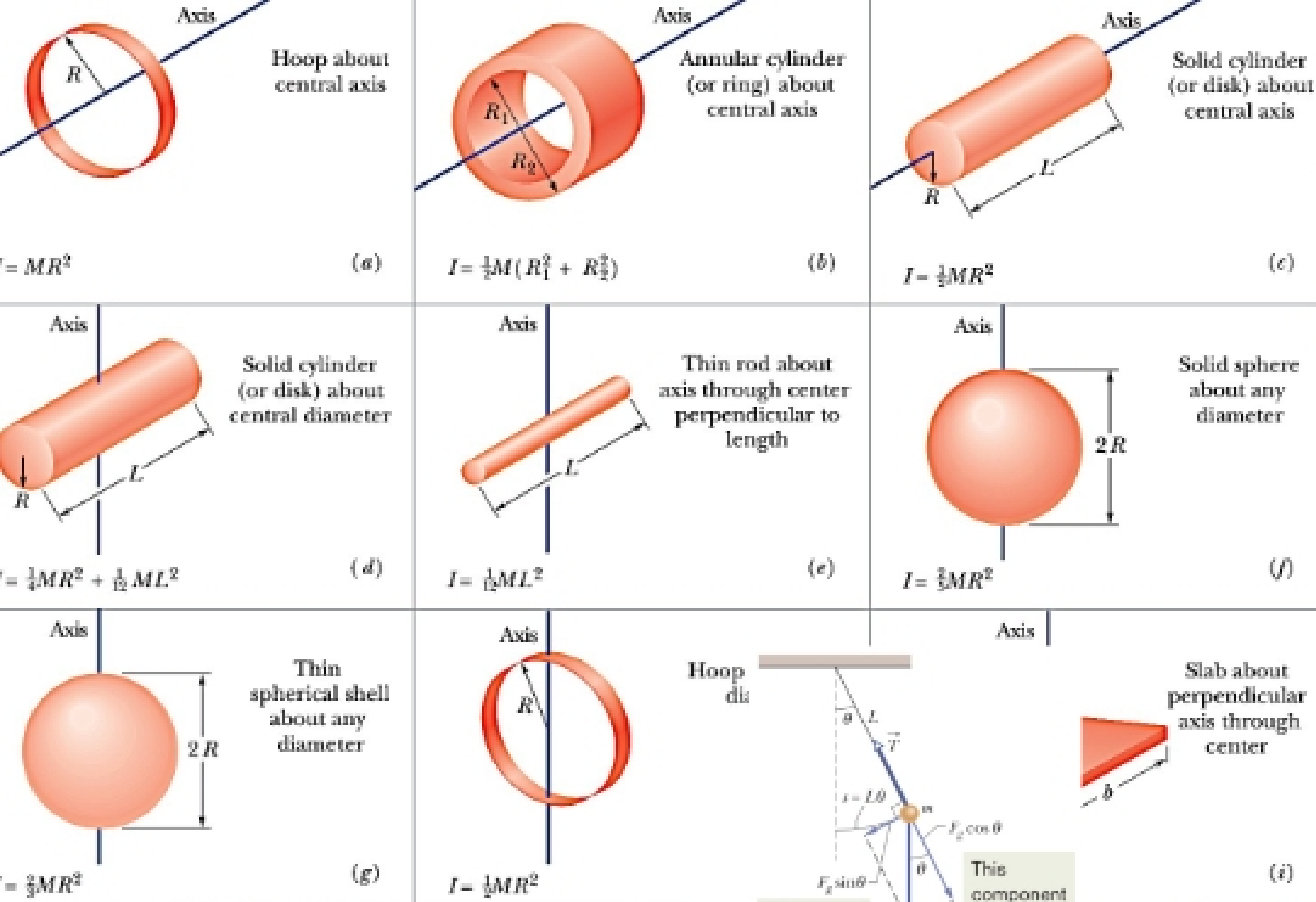
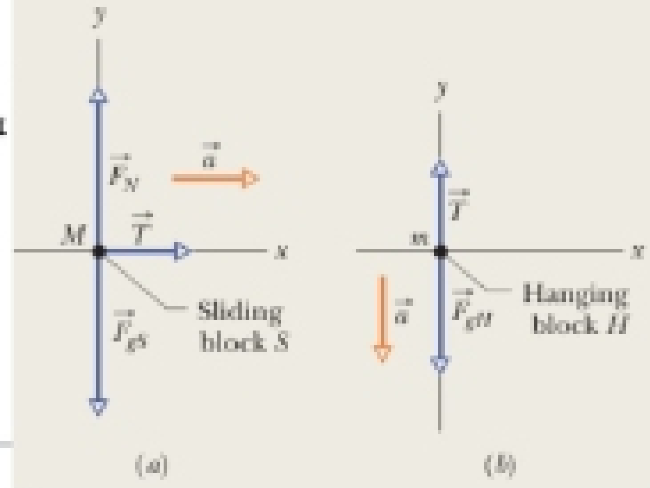




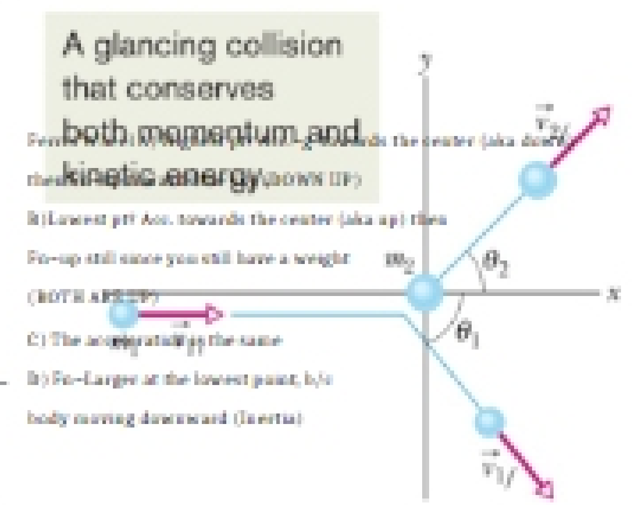
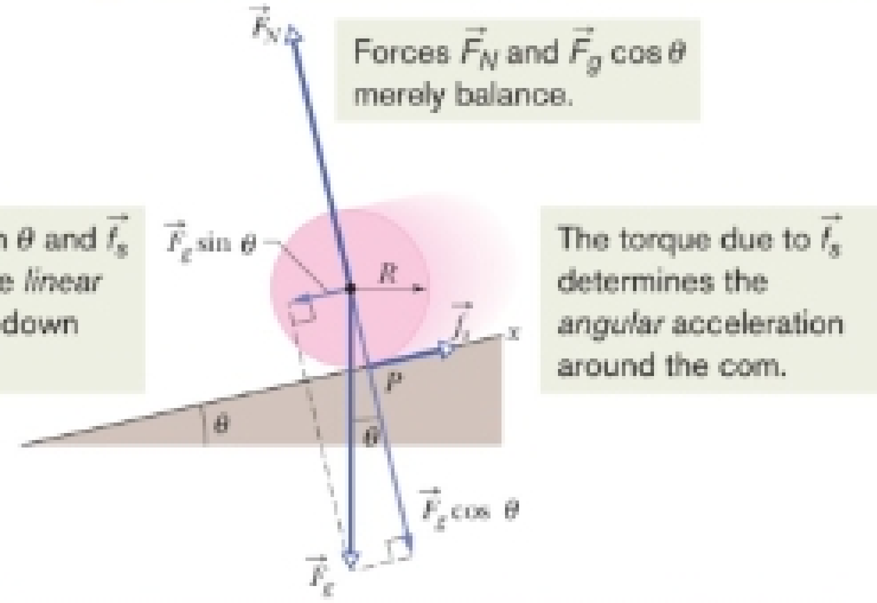


Figure 9-21 An elastic collision between two bodies in which the collision is not head-on. The body with mass m_2 (the target) is initially at rest.

...luid, a buoyant force $\vec{F}_b$ from the surrounding fluid ...ody. The force is directed upward and has a magni-

$$F_b = m_f g. \quad (14\text{-}16)$$



$$x - x_0 = v_0 t + \tfrac{1}{2}at^2,$$

$$v^2 = v_0^2 + 2a(x - x_0)$$

$$x - x_0 = \tfrac{1}{2}(v_0 + v)t$$

$$x - x_0 = vt - \ldots$$

$$W = \Delta E_{mec} = \Delta K + \ldots$$

$$x_{com} = \frac{1}{M}\sum_{i=1}^{n} m_i x_i$$

$$\vec{F}_{net} = \frac{d\vec{p}}{dt}$$

$$\vec{a}\cdot\vec{b} = (a_x\hat{i} + a_y\hat{j} + a_z\hat{k})\cdot(b_x\hat{i} + b_y\hat{j} + b_z\hat{k}),$$

$$\vec{J} = \int_{t_i}^{t_f} \vec{F}(t)\,dt$$

$$\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}.$$

$$J = F_{avg}\Delta t$$

1. ... Sun at one focus.
2. *The law of areas.* A line jo... out equal areas in equal tim... alent to conservation of ang...
3. *The law of periods.* The squ... proportional to the cube of t... circular orbits with radius r, ...

$$T^2 = \left(\frac{4\pi^2}{GM}\right)r^3 \quad \text{(law ...)}$$

$$E = -\frac{GMm}{2r}$$

$$\rho = \ldots$$

$$p = p_0 + \rho g h$$

Projectiles

$$x - x_0 = (v_0\cos\theta_0)t.$$

$$y - y_0 = (v_0\sin\theta_0)t - \tfrac{1}{2}gt^2,$$

$$v_y = v_0\sin\theta_0 - gt,$$

$$v_y^2 = (v_0\sin\theta_0)^2 - 2g(y - y_0).$$

$$R = \frac{v_0^2}{g}\sin 2\theta_0.$$

Conservation of momentum

$$\vec{P}_i = \vec{P}_f$$

$$\vec{p}_{1i} + \vec{p}_{2i} = \vec{p}_{1f} + \vec{p}_{2f}$$

$$m_1 v_{1i} + m_2 v_{2i} = m_1 v_{1f} + m_2 v_{2f}$$

$$v_{1f} = \frac{m_1 - m_2}{m_1 + m_2}v_{1i}$$

$$K_{1i} + K_{2i} = K_{1f} + K_{2f}$$

$$R_V = Av = \text{a constant},$$

Pascal's Principle A change in the pressure applied to an enclosed fluid is transmitted undiminished to every portion of the fluid and to the walls of the containing vessel.

$$a = -\omega^2 x_m \cos(\omega t + \phi)$$

$$\omega = \sqrt{\frac{k}{m}}$$

$$T = 2\pi\sqrt{\frac{m}{k}}$$

$$T = 2\pi\sqrt{I/\kappa} \quad \text{(torsion pendulum)},$$

$$T = 2\pi\sqrt{L/g} \quad \text{(simple pendulum)},$$

$$T = 2\pi\sqrt{I/mgh} \quad \text{(physical pendulum)}.$$

$$\omega' = \sqrt{\frac{k}{m} - \frac{b^2}{4m^2}}$$

$$Rv_{rel} = Ma \quad \text{(first rocket equation)}$$

$$v_f - v_i = v_{rel}\ln\frac{M_i}{M_f} \quad \text{(second rocket equation)}$$

$$\omega_d = \omega,$$

$$x(t) = x_m e^{-bt/2m}\cos(\omega' t + \phi),$$

$$E(t) \approx \tfrac{1}{2}kx_m^2 e^{-bt/m}$$

$$a = \frac{v^2}{r}. \quad T = \frac{2\pi r}{v}$$

$$F = \frac{mv^2}{R}$$

$$\theta = \frac{s}{r}$$

$$1\text{ rev} = 360° = 2\pi\text{ rad}.$$

$$k = \frac{2\pi}{\lambda}$$

$$v = \sqrt{\frac{\tau}{\mu}}$$

$$v = \frac{\omega}{k} = \frac{\lambda}{T} = \lambda f.$$

$$y(x,t) = y_m\sin(kx - \omega t)$$

$$P_{avg} = \tfrac{1}{2}\mu v\omega^2 y_m^2.$$

$$\vec{v}_{PA} = \vec{v}_{PB} + \vec{v}_{BA},$$

$$\vec{a}_{PA} = \vec{a}_{PB}$$

$$\omega = \omega_0 + \alpha t, \quad v = \omega r \quad \text{(radian ...)}$$

$$a_t = \alpha r$$

$$a_r = \frac{v^2}{r} = \omega^2 r$$

$$K = \tfrac{1}{2}I\omega^2$$

$$\theta - \theta_0 = \omega_0 t + \tfrac{1}{2}\alpha t^2,$$

$$\omega^2 = \omega_0^2 + 2\alpha(\theta - \theta_0)$$

$$\theta - \theta_0 = \tfrac{1}{2}(\omega_0 + \omega)t$$

$$T = \frac{2\pi r}{v} = \frac{2\pi}{\omega}$$

$$y(x,t) = h(kx \pm \omega t)$$

$$y'(x,t) = [2y_m\cos\tfrac{1}{2}\phi]\sin(kx - \omega t + \tfrac{1}{2}\phi)$$

$$y'(x,t) = [2y_m\sin kx]\cos\omega t.$$

343 m/s.

$$\vec{F}_{net} = m\vec{a},$$

$$I = \sum m_i r_i^2$$

$$1\text{ N} = 1\text{ kg}\cdot\text{m/s}^2.$$

$$f_{s,max} = \mu_s F_N$$

$$\ell = rmv\sin\phi$$

$$I = \int r^2\,dm$$

$$U(x) = \tfrac{1}{2}\ldots$$

$$F = G\frac{m_1 m_2}{r^2}$$

$$6.67\times 10^{-11}$$

$$f = \frac{v}{\lambda} = \frac{nv}{2L},$$

$$f' = f\frac{v \pm v_D}{v \pm v_S}$$