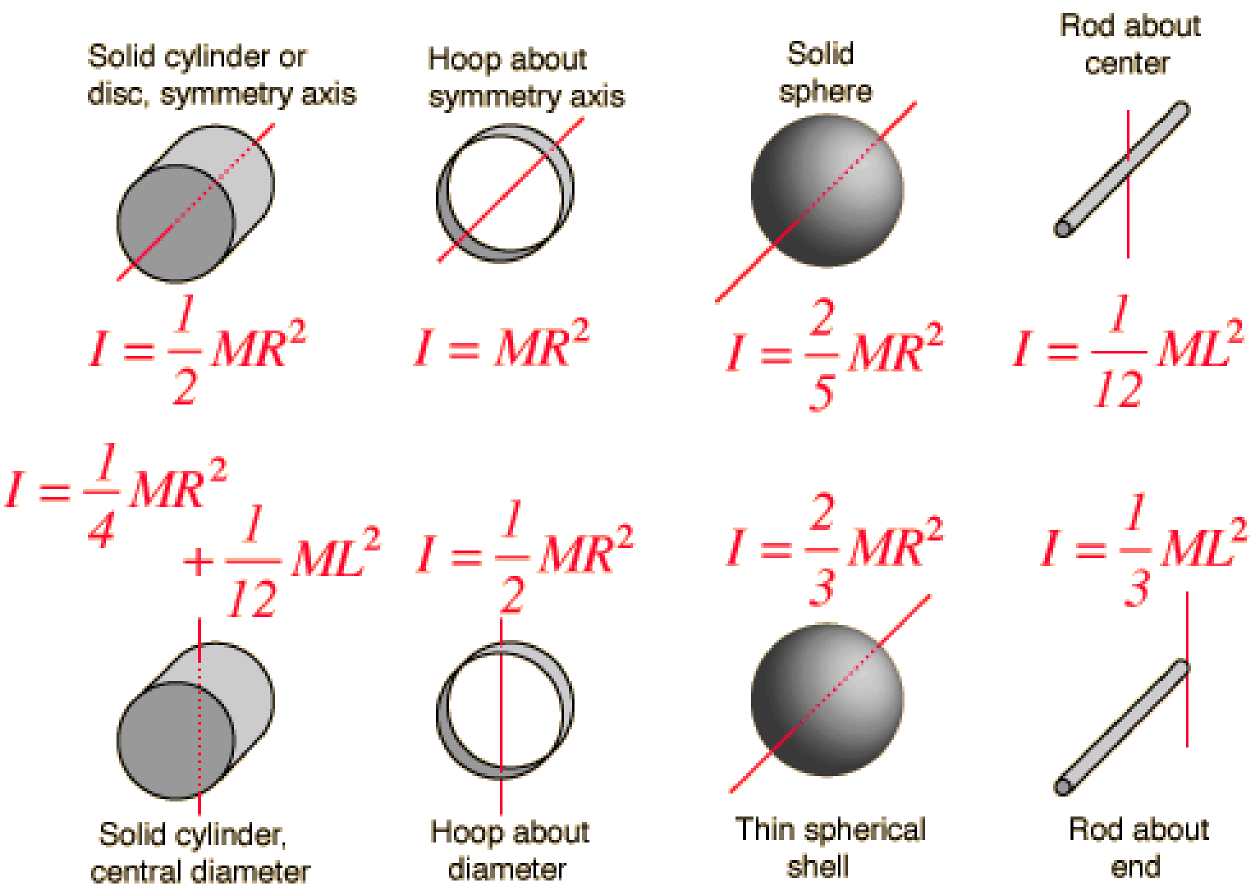
Making Things Rotate

- Like a net force makes objects accelerate, a net torque makes them want to rotate (angular acceleration): $\Sigma\vec{\tau} = I\vec{\alpha}$
  - I know I promised review on angular variables/vectors & cross product, but not needed for this homework
- Just like more mass means less acceleration, more **moment of inertia** means less angular acceleration

Moment of Inertia

- To calculate moment of inertia, need to know axis about which object(s) will rotate
  - If not constrained to rotate about some axis, will naturally rotate about center of mass
- Point mass: $I = mr^2$
- Solid object with size/shape: $I = \int r^2\, dm$

Precomputed Moments of Inertia



Parallel Axis Theorem

- Trick if you know moment of inertia about axis through center of mass, but want a different, parallel axis:

$$I = I_{cm} + M d^2$$

Rotational Kinetic Energy

- Rotating objects have kinetic energy

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

- Total energy of rotating (and moving) object:

$$K = \frac{1}{2} M v_{cm}^2 + \frac{1}{2} I \omega^2$$

- Trick with rolling objects: use $v_{CM} = R\omega$

$$K = \frac{1}{2} v_{cm}^2 \left(M + \frac{I}{R^2} \right)$$