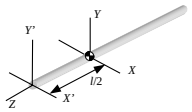
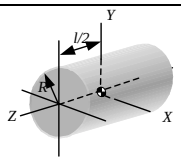
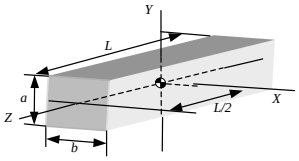
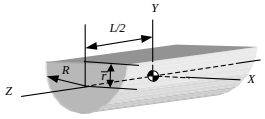
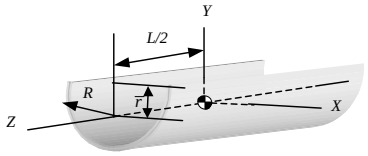
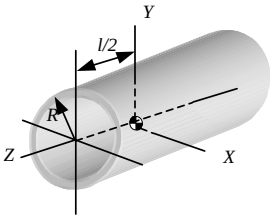
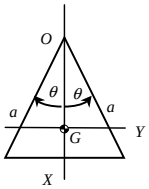
MASS MOMENTS OF INERTIA of USEFUL SOLID CONFIGURATIONS

Geometry	Inertia properties	Diagram of geometry
Slender Bar	$I_{XX} = I_{YY} = \frac{1}{12} ml^2$ $I_{X'X'} = I_{Y'Y'} = \frac{1}{3} ml^2$	
Cylinder (To apply for thin disk, let $L \to 0$)	$I_{XX} = I_{YY} = \frac{1}{12} m\left(3R^2 + L^2\right)$ $I_{ZZ} = \frac{1}{2} mR^2$	
Rectangular Prism (To apply for thin plate, let $L \to 0$)	$I_{XX} = \frac{1}{12} m\left(L^2 + a^2\right)$ $I_{YY} = \frac{1}{12} m\left(L^2 + b^2\right)$ $I_{ZZ} = \frac{1}{12} m\left(a^2 + b^2\right)$	
Half-Cylinder	$I_{XX} = \frac{9\pi^2 - 64}{36\pi^2} mR^2 + \frac{1}{12} mL^2$ $I_{YY} = \frac{1}{12} m\left(3R^2 + L^2\right)$ $I_{ZZ} = \frac{9\pi^2 - 32}{18\pi^2} mR^2 \quad \bar{r} = \frac{4R}{3\pi}$	
Half Cylindrical Shell	$I_{XX} = I_{YY} = \frac{1}{2} mR^2 + \frac{1}{12} mL^2$ $I_{ZZ} = \left(1 - \frac{4}{\pi^2}\right) mR^2$ $\bar{r} = \frac{2R}{\pi}$	
Cylindrical Shell	$I_{XX} = I_{YY} = \frac{1}{12} m\left(6R^2 + L^2\right)$ $I_{ZZ} = mR^2$	
Isosceles Triangle of unit thickness	$I_G = \frac{1}{18} ma^2\left(3\sin^2\theta + \cos^2\theta\right)$	

Indicates mass center of body

General expression for mass moment of inertia:

$$I_O = \int r_O^{\,2} dm$$

where: r_O is the location of the mass center of the differential mass element *dm* from point *O*.

Parallel axis theorem: $I_A = I_G + m d_{GA}^{\,2}$
where: I_O mass moment of inertia about centroid, d_{GA} distance from mass center *G* and *A*.

Mass moment of inertia for a point mass spinning a distance *l* from center O : $I_O = ml^2$

Radius of gyration: $I_O = m k_O^{\,2}$ where k_O is the radius of gyration about point *O*.