

### 3.4 Rotational Inertia: standard Summary and more complicated objects

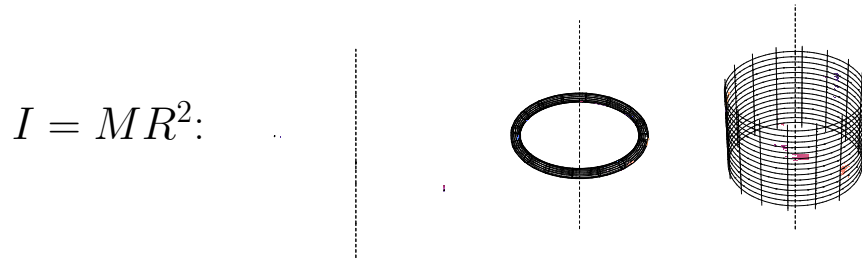


Figure 3.2: Formula  $I = MR^2$  is valid for *any* object with mass  $M$  distributed at the same distance  $R$  from the rotation axis. Ideal dumbbell, hoop and hollow cylinder are shown.

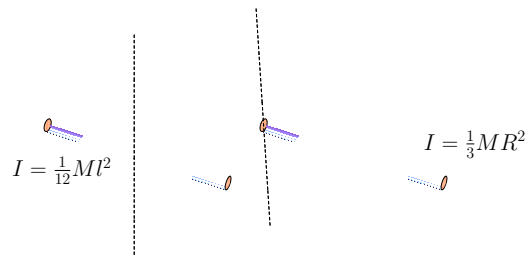


Figure 3.3: A uniform rod

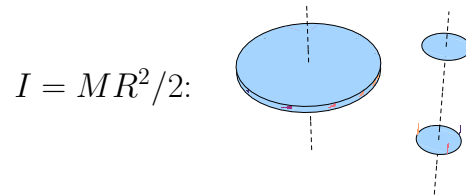


Figure 3.4: Formula  $I = MR^2/2$  is valid for a flat uniform disk or solid cylinder

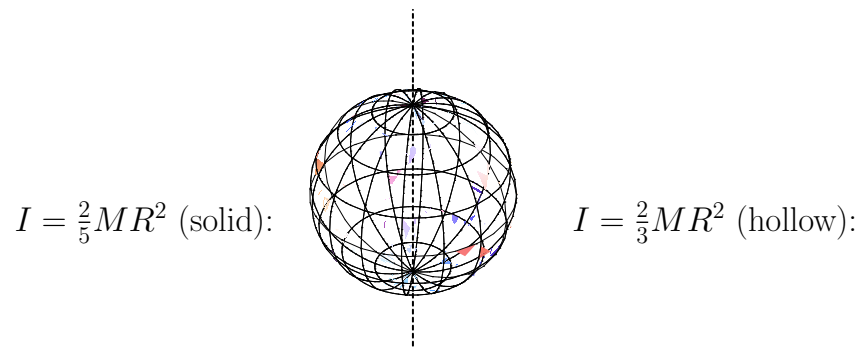


Figure 3.5: Solid and hollow spheres

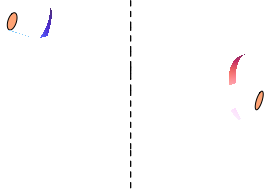
$$I = \frac{1}{12}Ml^2 + 2m(l/2)^2 + 2I_{sph}$$
A diagram of a dumbbell consisting of a central vertical dashed line representing the axis of rotation. Two spheres are attached to the ends of the axis. The sphere on the left is blue and the sphere on the right is red. The spheres are positioned at a distance of  $l/2$  from the center of the axis.

Figure 3.6: A real dumbbell: rod of length  $l$  with mass  $M$  and two solid spheres of mass  $m$  and radius  $R$  each.