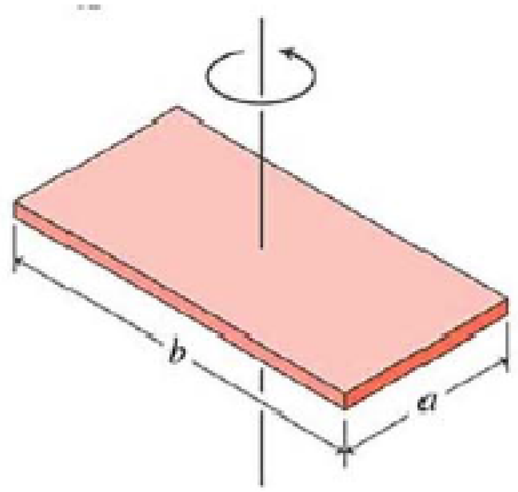
1) Organize and plan
   a. Chop up: Imagine chopping up the object differential-sized mass elements, each of which has a moment of inertia given by a known expression in terms of the mass and dimensions of the element. If all else fails, you can chop the object up into points with moment of inertia given by $dI = dm * r^2$.
   b. Picture: draw a diagram showing a representative differential piece of the object. The diagram should clearly show the parameterizing variable. Do NOT picture the mass element at an "extreme" part of the object; pick a representative part of the object.
   c. Parameterize the elements: define a variable or variables that have unique values associated with each individual element. Usually, these variables are either lengths or angles.
   d. List the integration limits of your parameterizing variables such that they describe the object.
   e. Find dl, dA, or dV, the length/area/volume of the differential element, by finding the dimensions of the element in terms your parameterizing variable(s). (Warning: this can be tricky if you are using an angle as a parameterizing variable: proceed with caution and draw a magnified version of your mass element if needed).
   f. Find dm, the mass of the differential element in terms of the parameterizing variable(s) by multiplying dl/dA/dV by the appropriate density. (If given the total mass, you may need to calculate the density).
2) Solve
   a. Write an expression for dI in terms of your parameterizing variables, using the known equation for the moment of inertia of the differential element.
   b. Integrate!

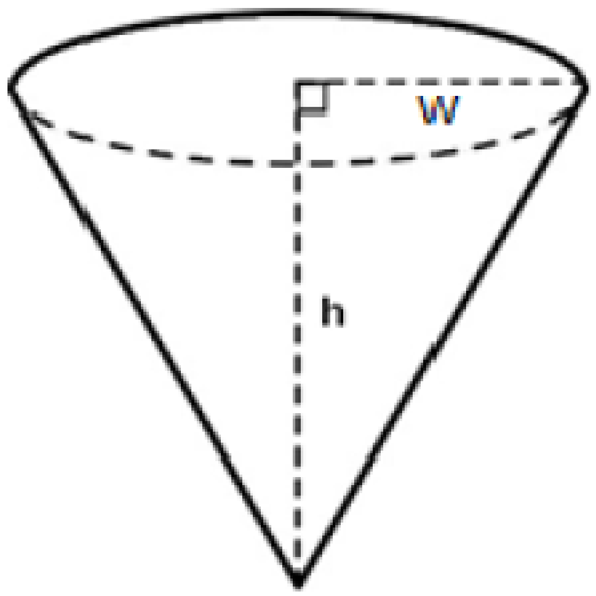
1. A thin uniform rod of mass M is rotating about an axis a distance Y away from the rod. The axis is perpendicular to the plane of the paper. Find the moment of inertia in terms of M, L1, L2, and Y.

2. The thin, uniform sheet shown to the right has mass M and rotates about an axis perpendicular to the sheet and through the center of the sheet. Find the moment of inertia of the sheet in terms of M, a, and b.



3

~~4~~ The cone shown has density ρ. Find the moment of inertia of the cone about its central vertical axis if h=w. Write your answer in terms of w and ρ. Hint: divide the cone into cylinders with differential widths. You can use that the moment of inertia of a thin hoop of mass M rotating about its axis of symmetry is MR^2 or that the moment of inertia of a solid disk of mass M rotating around its axis of symmetry is $MR^2/2$.



4. Find the moment of inertia of a solid ball with radius R about an axis through its center. Note that, depending on how you “chop up” the sphere you may encounter a difficult integral. Feel free to use an integral table.