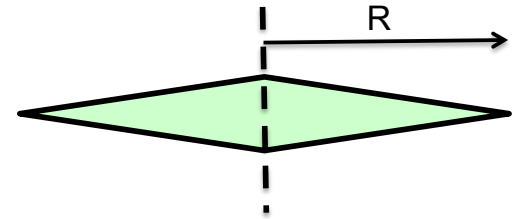


Problem Set #5 due beginning of class, Monday, Feb. 5.

- 1) Section 4.0 Exercise 1, collision of rotating bodies – what is the linear analogue for this problem?
- 2) Section 4.1 Example 1, Rotation Direction
- 3) Section 4.2 Exercise 1, Rotation and kinetic energy of two masses
- 4) Section 4.2 Exercise 2, Rotation and linear speed, bicycle problem
- 5) Section 4.3 Exercise 2, Turning a wrench
- 6) Section 4.3 Exercise 4, Pedaling a bicycle
- 7) Section 4.4 Exercise 2, Kinetic energy of two masses
- 8) Section 4.5 Exercise 1, Ranking Several Objects
- 9) Section 4.5 Exercise 2, Rolling Objects up a hill
- 10) Read Section 4.5, exercise 3 and do the following:

You invent a new kind of round discus that spins about a vertical axis (dotted line) as shown at right. The object has a thickness of t_0 at the axis (at $r=0$) that tapers evenly to a sharp edge at $r=R$, or $t = t_0(1-r/R)$. The mass of the discus is M ,



- a) Judging from moments of inertia of other objects (above question), please guess as best you can what should be the moment of inertia about the axis in terms of the variables given, and support your estimate with reasons. For starters, you might consider if this moment of inertia is greater or less than a rim of mass M , a disk of mass M , a hollow or solid sphere of mass M .
- b) Calculate exactly what the moment of inertia is by integrating over the mass. *Hint: You'll have to do two integrations for this: one to find the volume, and the next to find the moment of inertia. A similar problem was done in the moment of inertia video, and is found as exercise 3 in section 4.5.*