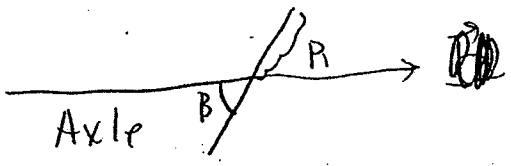
Physics 611, Prob Set #4

Due: In class, 2pm, Tuesday, Nov 25

1) A misaligned automobile tire, as shown below in side view

10 pts



is a ~~circular~~ uniform circular disk of mass m and radius R. Calculate its kinetic energy if ~~it is rotated about the~~ the ~~axle on~~ massless axle on which it is rigidly mounted is rotated at angular frequency Ω. For what value of ~~B is the energy~~ the angle B ~~that~~ between axle and wheel is the energy minimized?

2) Calculate the moment of inertia tensor for the following objects. In each case, choose whatever ~~origin and~~ axes you find most convenient, but specify your choice explicitly. Put your origin at the center of mass of the object.

a) A brick of uniform density, mass m, and dimensions as illustrated:

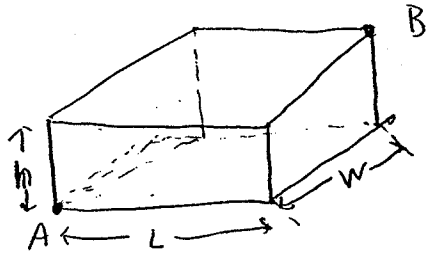
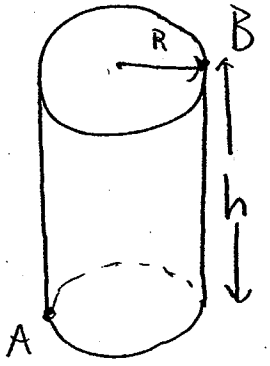


Fig (I) 5 pts

b) A uniform cylinder of the same mass, and dimensions illustrated below:



(Fig II) 5pts

c) A hollow cylinder (all its mass on the ~~our~~ outer wall of the cylinder, no caps) of the same dimensions and mass 5 pts

---

3) Find the kinetic energy of each of the systems ~~above~~ 15pts (a), (b), and (c) in problem (2) is rotated at an angular frequency ω about its "body diagonal", defined as the line between A and B in ~~the~~ figures (I) and (II). In (II), A lies directly below the point on the top circular cap opposite B.

PS43

4) Find the principle axes and moments of inertia about the center of mass of the ~~wheel~~ wheel and axle system in problem 1 if the axle is length ℓ and has the same mass as the wheel. 10 pts