# HW 8
Due December 8, 2006

Please answer all questions clearly and concisely. While you need not transcribe the question completely, it should be clear from your answer alone what you are talking about.

You are strongly encouraged to discuss the homework with your classmates, but you must complete the written homework by yourself, and of course, the material you submit must be your own.

Remember, show all of your work!

1) 7.3

2) Two identical particles of mass, $m = 1kg$, are connected by a solid rod of length, $l = 2m$, and allowed to pivot around an axis so that at lowest, one of the particles will just barely touch the ground (as shown).
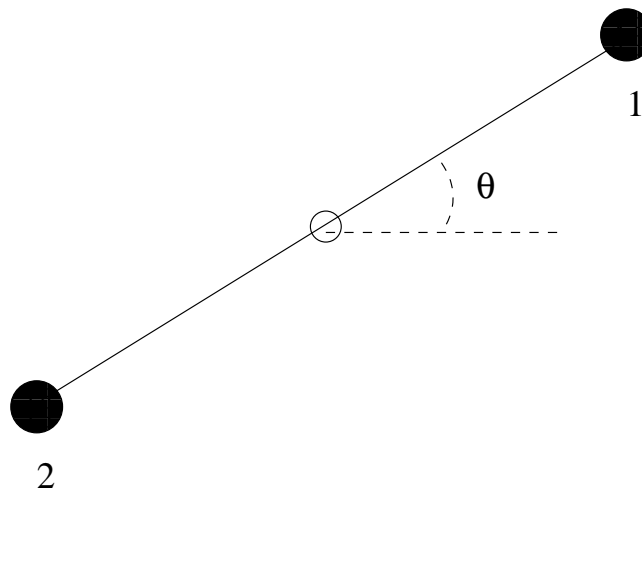
   a.. When the rod is at an angle θ, as shown, what is the gravitational potential energy of the 1st mass (with respect to the ground)? The 2nd mass? What is the total potential energy of the system?

   b.. What is the moment of inertia of the system?

   c.. Imagine I then *add* 40 J of energy to the system. What is the *rotational* kinetic energy afterwards?

   d.. Translational?

   e.. What speed will each of the masses have?

   f.. What is the instantaneous angular velocity (ω) of the rotation?

3) 8.5

4) 8.6

5) A sphere of mass, 4 kg is at rest on a table. A second sphere, of mass 2 kg strikes the first sphere (elastically!) with an initial velocity of $\vec{v}_{2,i} = 5$ m/s $\hat{i}$. After the collision, the second sphere is moving at an angle 10 degrees from the horizontal. What are the velocities of the two spheres after the collision?