Physics 262: Problem Set #2

These problems are due by the end of the day on Friday, Jan. 16 in the graders' box.
NOTE: For each problem, your solution should begin with a brief statement of the problem, i.e. a description of the setup, including a list of the inputs and the goal.

1. Shankar, problem 8.1.1 pg. 209.

2. Shankar, problem 8.1.7 pg. 211.

3. Find the period of a physical pendulum consisting of a disk of mass M and radius R attached to a rod of length L and mass m. (The pivot is at the other end of the rod.) What is the period when the disk is mounted to the rod by a frictionless bearing which allows the disk to spin freely?

4. Morin 8.13 (Oscillating ball) p. 336

5. Morin 8.20 (The superball) p. 337

6. Morin 8.61 (Perpendicular deflection) p. 345

7. A ladder of length $2L$ starts from rest, leaning against a frictionless wall at angle θ_0 with respect to horizontal. The ground is also frictionless, and the ladder starts to slide. At what angle θ does it lose contact with the wall? What is its horizontal speed at that point? (see Morin 8.3).

8. Morin 7.2 (Cross section) p. 296

9. A particle of mass m moves under the influence of an attractive central force Kr^4 with angular momentum ℓ. For what energy will the motion be circular, and what is the radios of that orbit? Find the frequency of radial oscillations if the particle is given a small radial impulse.

10. (BONUS) What values of n are circular orbits *stable* if the potential energy is $U(r) = -A/r^n$ (where $A > 0$)?