PHY 3221 : Intermediate Mechanics, Spring 2002

April 12^{th}, 2002

Assignment # 13

(due Friday April 19^{th}, 2002, at the beginning of class)

1. Problem 9.6 of Marion and Thornton's book.

2. Problem 9.10 of Marion and Thornton's book.

3. A long thin rod of length l and mass m hangs from a pivot about which is free to swing like a simple pendulum.

(a) Calculate the total angular momentum of the rod as a function of its instantaneous angular velocity ω. Compare the angular momentum obtained using Eq. (9.23) of your book to that obtained by direct calculation.

(b) Calculate the total kinetic energy of the rod as a function of its instantaneous angular velocity ω. Compare the kinetic energy obtained using Eq. (9.39) of your book to that obtained by direct calculation.

4. Calculate the moment of inertia of a uniform rod of length l and mass m with respect to an axis perpendicular to the rod at one end. Repeat the calculation for an axis perpendicular to the rod at the center.

5. Calculate the moment of inertia of a uniform hollow cylinder of mass M and radius R with respect to the longitudinal axis of the cylinder. Repeat the calculation for a uniform solid cylinder.