

PHY 504

Problem Set #9

due 6 November 2009

1. Derivation 5.7.
2. Derivation 5.8.
3. Exercise 5.15.
4. Following the argument of Sec. 5.7, consider the special case of a spinning top whose fixed point is at the center of mass. Evaluate the integral in eq. (5.63) for this case and find $\theta(t)$ and $\phi(t)$. Plot a typical trajectory in the $\theta\phi$ -plane.
5. A molecule consists of 4 identical atoms which are constrained to lie along a straight line, with an equilibrium distance b between adjacent atoms. For small oscillations about equilibrium, adjacent atoms are subject to a Hooke's Law force with spring constant k . Write down the Lagrangian for small oscillations. Obtain the eigenfrequencies and normal modes. Draw a picture of each of the 4 normal modes.