

September 8, 1999

PHY 337– Problem Set # 7

Continue reading Chapter 7 of **Marion**.

Consider the Lagrangian for the motion of a symmetric top under the acceleration of gravity:

$$L(\theta, \phi, \psi, \dot{\theta}, \dot{\phi}, \dot{\psi}) = \frac{1}{2}A (\dot{\phi}^2 \sin^2(\theta) + \dot{\theta}^2) + \frac{1}{2}B (\dot{\phi} \cos(\theta) + \dot{\psi})^2 - Mgh \cos(\theta),$$

where A , B , M , g , and h are parameters related to the moments of inertia, the mass, the acceleration of gravity, and the location of the center of mass. The angles θ , ϕ , and ψ are called the “Euler angles” and are the generalized coordinates for this system. Find the equations of motion and identify the constants of the motion.