

**PHY 711 – Problem Set # 9**

Continue reading Chapter 3 in **Fetter and Walecka**.

Consider the following Lagrangians. For each, determine the equations and constants of motion. Also write the corresponding Hamiltonian. Assume that  $A$ ,  $B$ ,  $M$ ,  $g$ ,  $h$ ,  $q$ , and  $c$  are constant parameters.

1.

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

2.

$$L(x, y, z, \dot{x}, \dot{y}, \dot{z}) = \frac{1}{2}M(\dot{x}^2 + \dot{y}^2 + \dot{z}^2) + \frac{1}{2} \frac{q}{c} B(xy - yx).$$