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. 

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

2. 

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