1 Simple Pendulum

A simple plane pendulum has a length l, bob mass m, and is in a uniform gravitational field, g. Use θ, the angle the pendulum swings from equilibrium, as the generalized coordinate. Find **(a)** the Lagrangian $L\left(\theta, \dot{\theta}\right)$, **(b)** p_θ, the momentum conjugate to θ, as a function of m, g, l, θ and $\dot{\theta}$, **(c)** the Hamiltonian $H\left(\theta, p_\theta\right)$, **(d)** Hamilton's equation of motion for p_θ ($\dot{p}_\theta =?$), and **(e)** Hamilton's equation of motion for θ ($\dot{\theta} =?$).