

**Problem 4**

1. Obtain the Hamiltonian and the canonical equations for a particle in a central force field. Hint: Start from Lagrangian function in the spherical coordinates and use the Legendre transformation.
2. Take two of the initial conditions to be  $p_\phi(0) = 0$  and  $\phi(0) = \pi/2$  (this is essentially the choice of a particular [spherical coordinates](#) system). Discuss the resulting simplification of the canonical equations.