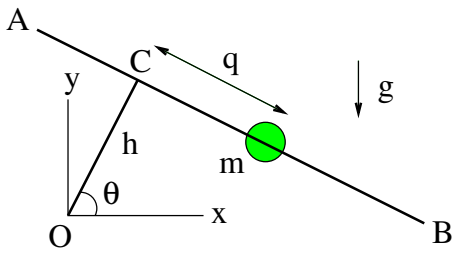
[mex78] Bead sliding on rotating rod in vertical plane

The rod AB rotates with constant angular velocity $\dot{\theta} = \omega$ at fixed perpendicular distance h about point O in a vertical plane. A bead of mass m is free to slide along the rod. Its position (relative to point C) on the rod is described by the variable q. (a) Construct the Lagrangian $L(q, \dot{q}, t)$ and derive the Lagrange equation for the variable $q(t)$. (b) Solve the Lagrange equation for the following initial conditions: $\theta(0) = q(0) = \dot{q}(0) = 0$. (c) Construct the Hamiltonian $H(q, p, t)$ from L. Determine whether or not H represents the total energy of the bead.



Solution: