[mex188] Lagrangian from Hamiltonian via Legende transform

Given a Hamiltonian system $H(q_1, \ldots, q_n, p_1, \ldots, p_n, t)$ and the associated canonical equations $\dot{q}_i = \partial H/\partial p_i,\ \dot{p}_i = -\partial H/\partial q_i,\ i = 1, \ldots, n$, find the Lagrangian $L(q_1, \ldots, q_n, \dot{q}_1, \ldots, \dot{q}_n, t)$ of the same system via Legendre transform, derive the Lagrange equations for the generalized coordinates $q_1, \ldots, q_n$ and establish the relation $\partial L/\partial t = -\partial H/\partial t$.

Solution: