

6.8: Hamilton's Equations

Having finally established that we can write, for an incremental change along the dynamical path of the system in phase space,

$$dH(q_i, p_i) = - \sum_i \dot{p}_i dq_i + \sum_i \dot{q}_i dp_i \quad (6.8.1)$$

we have immediately the so-called **canonical form** of Hamilton's equations of motion:

$$\begin{aligned} \frac{\partial H}{\partial p_i} &= \dot{q}_i \\ \frac{\partial H}{\partial q_i} &= -\dot{p}_i \end{aligned}$$

Evidently going from state space to phase space has replaced the second order Euler-Lagrange equations with this equivalent set of pairs of first order equations.

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