

Part VII

Hamiltonian Mechanics

The equations of motion in classical mechanics arise as solutions of variational problems. For a general mechanical system of n particles in \mathbb{R}^3 , the physical path satisfies Newton's second law. On the other hand, the physical path minimizes the mean value of kinetic minus potential energy. This quantity is called the action. For a system with constraints, the physical path is the path which minimizes the action among all paths satisfying the constraint.

The Legendre transform (Lecture 20) gives the relation between the variational (Euler-Lagrange) and the symplectic (Hamilton-Jacobi) formulations of the equations of motion.