

$\frac{d}{dt} \left(\frac{\partial L}{\partial \dot{q}_i} \right) = \frac{\partial L}{\partial q_i}$

$$\frac{d}{dt} (m \dot{q}_i) = -\frac{\partial V}{\partial q_i}$$

where

$$L = T - V = \frac{1}{2} m \dot{q}_i^2 - V(q_i)$$