The principle of least action.

The equation of motion of a particle in a central force is given by

\[ \frac{d^2x}{dt^2} = -\frac{\mathbf{F}(x)}{m} \]

where \( \mathbf{F}(x) \) is the force acting on the particle, and \( m \) is its mass.

The principle of least action states that the path taken by a particle between two points is the one that minimizes the action integral,

\[ S = \int L(x, \dot{x}) \, dt \]

where \( L(x, \dot{x}) \) is the Lagrangian of the system.

The Euler-Lagrange equation is a differential equation that relates the Lagrangian to the equations of motion.

\[ \frac{d}{dt} \left( \frac{\partial L}{\partial \dot{x}} \right) - \frac{\partial L}{\partial x} = 0 \]

In the case of central forces, the Lagrangian simplifies to

\[ L = \frac{1}{2} m \dot{x}^2 - V(x) \]

where \( V(x) \) is the potential energy.

The equations of motion can then be derived from the Lagrangian by solving the Euler-Lagrange equation.

The principle of least action is a fundamental principle in physics, used in classical mechanics to determine the equations of motion for a system.