

Problem 1. Compute an action corresponding to the classical motion of a free particle.

Problem 2. Show that the Euler-Lagrange equation of $L(q, \dot{q}, \ddot{q})$ is a fourth order ordinary differential equation.

Problem 3. Write the Euler-Lagrange equation and solve it

$$L = \dot{x}^2 + \tan^2 x$$

Problem 4. Write the Euler-Lagrange equation and solve it

$$L = \frac{\dot{x}^2}{x} - x$$