

Homework 1 (10 points each problem)

1. Derive the Lagrange equation

2. Show that adding total derivative function to the Lagrangian will not change the Lagrange equations.

3. Using the Lagrangian of electromagnetic interaction :

$$L = \frac{1}{2} m \dot{\mathbf{r}}^2 - q \varphi(\mathbf{r}, t) + \frac{q}{c} \vec{\mathbf{A}}(\mathbf{r}, t) \cdot \dot{\mathbf{r}}$$

- (a) Obtain the Lorentz force using the Hamilton principle
- (b) Calculate the generalized momentum and the generalized force

4. Show that Lagrange Equations are invariant with respect to Galilean transformations