

Homework 2. PHY 564

Problem 1. 4 points. Plane bent trajectory

Consider a curved but plane (not torsion, only curvature) reference trajectory laying in $y=0$ plane. Use Lorenz force and mechanical momentum to derive equations (123), (124), (125) and (126) from Lecture 4.

Problem 2. 6 points. Specific gauge for 4-potential

Use Lecture 3 equation (107) expressions for curl and gradient, and equation (105) for g^{ik} . Prove that 4-potential formulae in eq. (118) in Lecture 4 generate accurate expressions for all component of electric and magnetic fields from

$$\vec{B} = \text{curl} \vec{A}, \quad \vec{E} = -\frac{1}{c} \cdot \frac{\partial \vec{A}}{\partial t} - \vec{\nabla} \varphi$$

Note: this is so called STAR problem – I will increase points 5-fold if you find error in expansion (118).