Homework 3 (10 points each problem)

1. From the relativistic Lagrangian obtain the equation of motion of free particle, using minimal action principle.

2. Using $A'^{\mu} = \frac{\partial x'^{\mu}}{\partial x^{\nu}} A^{\nu}$ and the definition of the scalar product obtain the transformation relation for A_{μ}'.

3. Obtain the transformation relation for $g_{\mu\upsilon}$ and $g^{\mu\upsilon}$ as well as calculate $g_{\mu\alpha}\, g^{\mu\upsilon}$.

4. (5 points). Show that the tensor relations are invariant with respect to the general transformation (covariance theorem)

5. From equation of motion of free particle in the local inertial reference frame obtain the same equation in a arbitrare reference frame (the equation that contains Affine connection)