

## Homework 2 (10 points each problem)

1. Show that four - product  $A^\mu B_\mu$  is Lorentz invariant

2. Show that  $g_{\mu\nu} A^\nu = A_\mu$  and  $g^{\mu\nu} A_\nu = A^\mu$ .

3. Show that  $\delta^\mu_\nu$ ,  $g_{\mu\nu}$  and  $g^{\mu\nu}$  are Lorentz invariant tensors

4. (20 points) Derive the relativistic Lagrangian for the free particle. Using the L function obtain the relativistic three momentum and energy of the free particle.