8.251 – Homework 9
Corrected 4/16/07[1]

B. Zwiebach   Spring 2007

Due Wednesday, April 18.

1. (10 points) Problem 11.1.

2. (10 points) Problem 11.2.

3. (10 points) Problem 11.5.

4. (15 points) Problem 11.6.

5. (15 points) A modified version of Problem 11.7.

   Transformations generated by the light-cone gauge Lorentz generators M^{+-} and M^{-I}.

   (a) Calculate the commutator of M^{+-} (defined in (11.86)) with the light-cone coordinates $x^+(\tau)$, $x^-(\tau)$, and $x^I(\tau)$. Show that M^{+-} generates the expected Lorentz transformations of these coordinates.

   (b) Calculate the commutator of M^{-I} with the light-cone coordinates $x^+(\tau), x^-(\tau)$, and $x^J(\tau)$. Show that M^{-I} generates the expected Lorentz transformations together with a compensating reparameterization of the world-line. Calculate the parameter λ for this reparameterization. [*Hint:* The reparameterization takes the "hermiticized" form $\delta x^\mu(\tau) = \frac{1}{2}(\lambda\,\partial_\tau x^\mu + \partial_\tau x^\mu\,\lambda)$.]

6. (10 points) Problem 12.1.