8.251 – Homework 9
Corrected 4/16/07

B. Zwiebach
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 $\lambda$ 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.

\footnote{Problem 5(b) was fixed: “from” changed to “form.”}