

Problem Set 2

Physics 483

Due November 18

Some abbreviations: Pol - Polchinski

1. Pol 3.2

2. The linear dilaton background is an example that we have not considered in detail but is very nice.

(i) Using the energy-momentum tensor defined on p.49, explicitly compute the $T(z)T(z)$ OPE, and determine the central charge.

(ii) Compute the OPE of $J^\mu(z) = \frac{i}{\alpha'} \partial_z X^\mu$ with $T(z)$. What does the result teach you about the charge

$$\oint \frac{dz}{2\pi i} J^\mu(z)$$

on a genus g Riemann surface.

(iii) Check that this background satisfies the β -function equations of motion (p.111) with a varying dilaton, and a non-critical D . What can you conclude about string perturbation theory in such a background?

3. Pol. 3.13; how do you make a critical string background out of this non-critical S^3 background? (Hint: this is related to the previous problem).

4. Pol. 3.14

5. Pol. 4.4

6. Pol. 5.3