P661 Homework # 7 10/14/04

Due Tuesday 10/26/04

Finish reading Chapter 8.

Part 1

(1) In class, we constructed the T^2/Z_2 orbifold. For a torus with a Z_3 symmetry, we find that T^2/Z_2 is a tetrahedron, with the topology of a sphere. What is the shape of T^2/Z_3 ? How many fixed points does it has ?

Part 2:

(2) Starting with the same torus, find the shape and the number of fixed points in the T^2/Z_6 orbifold. Start with a square torus, fnd the shape and the number of fixed points in the T^2/Z_2 and T^2/Z_4 orbifolds. Note that there can be different types of fixed points in an orbifold.

(3) A Z_2 twist on S^1 yields the S^1/Z_2 orbifold. Show that the partition function Z' Eq.(8.5.11) is that of S^1/Z_2 CFT. Use Eq.(7.2.37) to write it in terms of the Θ functions given in Homework 3. Show that it is modular invariant.

Argue that a Z_2 twist on S^1/Z_2 gives back the S^1.

Now go back to the partition function (8.2.9). Check that twisting the compactified X^{25} with the inclusion of the twisted sectors gives a modular invariant Z' for the bosonic string theory.

(4) Check Eq.(8.5.21).

(5) If you have not derived Eq.(2.9.19), do it now.