

# Homework 4

## Geometrical methods in theoretical physics HT-15

1. Take a two sphere  $S^4$  and calculate the following trace over the space of all differential forms  $\Omega^\bullet(S^4)$

$$\text{tr}((-1)^F e^{-\beta\Delta}) ,$$

where  $\Delta$  is Laplace operator on forms.

Do the same for  $S^3$ . Why the answers are different?

[*Hint:* see the lecture notes for the notations]

**to be handed in before 5 p.m., January 15, 2016**