

HOMEWORK

- 1- COMPUTE THE ~~THE~~ FREE ENERGY OF A GAS OF $N=4$ SYM AT FINITE T . (AT ZERO COUPLING)
8 PHYSICAL BOSONIC DEGREES OF FREEDOM. (8 BOSONIC FIELDS)
+
8 FERMIONIC FIELDS.
(WITH N^2 OF EACH)

- 2- COMPARE WITH THE FREE ENERGY OF THE SOLUTION: (IN 5-d):

$$\text{SOE } ds^2 = \frac{R_{\text{Ads}}^2}{z^2} \left[-\left(1 - \left(\frac{z}{z_0}\right)^4\right) dt^2 + \frac{dz^2}{\left(1 - \left(\frac{z}{z_0}\right)^4\right)} + dx^2 \right]$$

- a) COMPUTE β AS A FUNCTION OF z_0

$$t \rightarrow i t_E, \quad t_E \sim t_E + \beta$$

& ADJUST z_0 SO THAT THE METRIC AT $z = z_0$ IS NON-SINGULAR.

- b) USE THAT THE 5-d G_N CONSTANT OBEYS

$$\frac{(R_{\text{Ads}})^3}{4G_N} = \frac{N^2}{2\pi}$$

- c) COMPUTE $S = \frac{\text{AREA}}{4G_N}$

- 3- YOU SHOULD FIND THAT

$$\frac{3}{4} S_{\text{ZERO COUPLING}} = S_{\text{GRAVITY}}$$