

Problem 2

In a supersymmetric field theory, the trace anomaly coefficients a and c are given by the formulae

$$a = \frac{3}{32} (3\text{Tr}R^3 - 3\text{Tr}R) \quad , \quad c = \frac{1}{32} (9\text{Tr}R^3 - 5\text{Tr}R) \quad ,$$

where R refers to the $U(1)_R$ charges, and the trace is over all the chiral fermion fields.

a) Calculate a and c in the following two gauge theories: the $\mathcal{N} = 2$ supersymmetric Z_2 orbifold quiver, and the $\mathcal{N} = 1$ SCFT on N D3-branes at the conifold.

b) For $AdS_5 \times Y$ with N units of RR 5-form flux, it was found at leading order in N that

$$a = c = \frac{N^2 \pi^3}{4\text{vol}(Y)} \quad ,$$

where the radius of Y is normalized so that $R_{ij} = 4g_{ij}$ on Y . Compare this formula with the gauge theory results of part a).