**Problem set #13**

1. Mirror Symmetry in 3 dimensions
Using a corresponding brane configuration compute the 3d mirror for the following theories. For each of these groups add n flavors in the fundamental representation and write down the corresponding quiver gauge theory both for the theory itself and for its mirror:
a) U(1) with n flavors
b) SU2) with n flavors
c) U(k) with n flavors
d) Sp(k) with n flavors
e) So(k) with n flavors
f) Comment on the relation of the first two results to affine Dynkin diagrams.
g) Using f) find a quiver for the moduli space of E_n instantons, n=6,7,8.
h) What are the restrictions on n in each case?
i) For each case compute the dimension of the moduli space on the Higgs branch and on the Coulomb branch and verify that there is a matching with the expectation that both theories are mirror to each other.

2) Five dimensional fixed points and their low energy gauge theory limits
a) Write down the (p,q) web representation for SU(2) gauge theory with n flavors for n=0,1,2.
b) Find the corresponding parameters and moduli which contribute to the mass formula of the BPS states in the theory.
c) Determine what are the W-boson, instanton and monopole for each theory.
d) Find their corresponding mass and tension formulas in terms of the underlying parameters and moduli found in b)

3) Continuation past infinite coupling
a) Consider a 5 dimensional (8 supercharges) SU(n) gauge theory with k flavors in the fundamental representation. Write down the set of parameters and moduli of the gauge theory.
b) Find the continuation past infinite coupling for these theories.
c) For the case n=4, k=0 write down a map between the parameters and moduli in both theories
d) Find how many different, in-equivalent, theories are there for the case n=4, k=0.