

## PHYS 724 - Problem Set 19

1.

a) Show that the non-Abelian field tensor  $F_{\mu\nu}$  defined by

$$F_{\mu\nu} = \partial_\mu A_\nu - \partial_\nu A_\mu + i[A_\mu, A_\nu]$$

gauge transforms according to the following rule:

$$F'_{\mu\nu} = U F_{\mu\nu} U^{-1}$$

where the matrix  $U(\vec{\alpha})$  describes the gauge transformation.

b) Hence show that the components  $F_{\mu\nu}^k$  belong to a multiplet of the adjoint representation of the gauge group. Thus, how many gluons do you expect in the SU(3) theory of quantum chromodynamics?