Home Work

1. Prove that if E_α and E_β are roots than $[E_\alpha, E_\beta] = C\, E_{\alpha+\beta}$, where C is a constant.

2. Find the for the following free fields the largest symmetry group and the corresponding Noether current:

   a) N real massless scalar fields;

   b) N real scalar fields with a generic mass matrix;

   c) N complex massless scalar fields;

   e) N massless Dirac spin 1/2 fields.

3. Consider the Gell-mann matrices that generates $SU(3)$ in the fundamental representation. Find as many as possible $SU(2)$ subalgebras.