MATH431 - Modern Particle Physics

Set Work: Sheet 7; Due:

1. Show that a unitary matrix U can be written as U^{iH}. What are the condition that the matrix H must satisfy?

2. Consider the simple unitary group $SU(4)$.

(a.) How many diagonal generators of the Lie algebra are there? Write down a representation of the diagonal generators in the terms of 4×4 hermitian matrices.

(b.) What is the dimension of the group? Write down a representation of the generators in terms of 4×4 hermitian matrices.

(c.) What is the fundamental representation of $SU(4)$? Write down its decomposition in terms of a maximal subgroup.

(d.) Draw the graphic illustration of the fundamental representation.

(e.) Find the product and the decomposition under the maximal subgroup of the fundamental times the anti-fundamental representations of $SU(4)$.

(f.) Find the product and the decomposition under the maximal subgroup of the fundamental times the fundamental representations of $SU(4)$.