Physics 223B, Joe Kiskis

Notes on the tensor method of Georgi, Sec. 10.5

Although it is not too hard to grasp the results in Sec. 10.5, it is totally unclear from reading this what the general method is. I think it goes something like this: One begins with an object like the LHS's of Eqs. 10.21, 10.26, or 10.29. I'll call that M. The other tensors available are the two invariant tensors δ and ϵ. So M, δ, and ϵ altogether.

In the first step, use the invariant tensors to form all possible nonzero contractions with M. These are either manifestly irreps or need to be further decomposed as per this method to get their irrep content. I suppose that all objects simpler than the given M have already been worked out. Thus, the contractions can be considered already understood. For example, ϵvu in Eq. 10.23 is a contraction.

In the second step, use the invariant tensors to give the contractions the same index structure as M. Call these the modified contractions. The $\epsilon\epsilon vu$ term in 10.21 is an example.

In the third step, add the modified contractions to M with arbitrary coefficients to get a modified M.

In the fourth step, determine the coefficients by demanding that the modified M have vanishing contractions with the invariant tensors. This fixed modified M is then the irrep with a highest weight that is the sum of the highest weights of the irreps in the tensor product.

In the fifth step, add more of the modified contractions to the fixed modified M so that the whole sum is equal to the original M. With that, M is written as a sum of pieces each of which is an irrep. Equations 10.21 and 10.26 are examples. Ever so simple, eh?
