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Apoorva Khare* (khare@stanford.edu). *Inclusion relations between faces of highest weight modules.*

We report on recent progress in the study of highest weight modules \mathbb{V}^λ over a complex semisimple Lie algebra \mathfrak{g} . We study the sets of weights that lie on the faces of \mathbb{V}^λ , which we call “standard parabolic subsets of weights”. We show that the sets of simple roots whose corresponding standard parabolic subsets of weights are equal form intervals. Moreover, we provide the first closed-form expressions for the maximum and minimum elements of the aforementioned intervals, for all highest weight modules \mathbb{V}^λ over semisimple Lie algebras \mathfrak{g} . This completely resolves questions studied by Vinberg and very recently by Cellini-Marietti; surprisingly, the max/min formulas only require the Dynkin diagram of \mathfrak{g} and the integrability data of \mathbb{V}^λ .

As an application, we compute the dimension, stabilizer, vertex set, and f -polynomial of standard parabolic faces of highest weight modules, and show that they are completely determined by the aforementioned closed-form expressions. Some of these results were recently shown for the adjoint representation of a simple Lie algebra, but analogues remain unknown for any other finite- or infinite-dimensional highest weight module. (Received September 09, 2014)