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Generalized Cluster Algebra Positivity and Applications

Cluster algebras are celebrated for their positivity properties, and this positivity hints at beautiful underlying structure. We study this positivity through both a combinatorial and mirror symmetric lens, giving a new understanding of consistent scattering diagrams in rank 2. We give a combinatorial formula for their wall-function coefficients in terms of new objects on Dyck paths, called tight gradings. We use this manifestly-positive formula to prove Laurent positivity for generalized cluster algebras. Our formula also yields explicit expressions for relative Gromov–Witten invariants on weighted projective planes and the Euler characteristics of moduli spaces of framed stable representations on complete bipartite quivers. This is joint work with Kyungyong Lee and Lang Mou.