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Smoothing Gorenstein toric singularities and mirror symmetry

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Abstract
We establish a correspondence between one-parameter deformations of an affine Gorenstein toric variety X, defined by a polytope P, and mutations of a Laurent polynomial f, whose Newton polytope is equal to P. If the Newton polytope P of f is two dimensional and there exists a set of mutations of f that mutate P to a smooth polygon, then, under certain assumptions, we show that the Gorenstein toric variety, defined by P, admits a smoothing. This smoothing is obtained by proving that the corresponding one-parameter deformation families are unobstructed and that the general fiber of this deformation family is smooth. Our assumptions hold for all polygons that are affine equivalent to a facet of a reflexive three-dimensional polytope Q, and thus we are able to provide applications to mirror symmetry and deformation theory of the Fano toric variety corresponding to Q.

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