MAHLER MEASURES OF HYPERGEOMETRIC CALABI-YAU MANIFOLDS

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ABSTRACT. The (logarithmic) Mahler measure of an n-variable Laurent polynomial P is defined as $m(P) = \int_0^1 \cdots \int_0^1 \log |P(e^{2\pi i\theta_1}, \ldots, e^{2\pi i\theta_n})| \, d\theta_1 \cdots d\theta_n$. It has been proved and conjectured that Mahler measures of some polynomials are related to special values of L-functions. For instance, in the two-variable case, Mahler measures of certain families of polynomials are rational multiples of $L'(E, 0)$, where E is the elliptic curve defined by the projective closure of the corresponding polynomial. Similar phenomenon appears in the three-variable case when the polynomials define $K3$ surfaces which are associated with some weight 3 modular forms. We will exhibit some new results for those of hypergeometric type and briefly explain how to prove them. Many conjectured formulas obtained from numerical computations will also be presented.