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\(\beta\)-density function on the class group of projective toric varieties. (English) [Zbl 07389888]

Summary: We prove the existence of a compactly supported, continuous (except at finitely many points) function \(g_{I,m}: [0, \infty) \rightarrow \mathbb{R}\) for all monomial prime ideals \(I\) of \(R\) of height one where \((R,m)\) is the homogeneous coordinate ring associated to a projectively normal toric pair \((X, D)\), such that

\[\int_0^\infty g_{I,m}(\lambda)d\lambda = \beta(I, m),\]

where \(\beta(I, m)\) is the second coefficient of the Hilbert-Kunz function of \(I\) with respect to the maximal ideal \(m\), as proved by Huneke-McDermott-Monsky [8]. Using the above result, for standard graded normal affine monoid rings we give a complete description of the class map \(\tau_m: \text{Cl}(R) \rightarrow \mathbb{R}\) introduced in [8] to prove the existence of the second coefficient of the Hilbert-Kunz function. Moreover, we show the function \(g_{I,m}\) is multiplicative on Segre products with the expression involving the first two coefficients of the Hilbert polynomial of the rings and the ideals.

MSC:

13D40  Hilbert-Samuel and Hilbert-Kunz functions; Poincaré series
13H15  Multiplicity theory and related topics
14M25  Toric varieties, Newton polyhedra, Okounkov bodies
52B20  Lattice polytopes in convex geometry (including relations with commutative algebra and algebraic geometry)

Keywords:

coefficients of Hilbert-Kunz function; Hilbert-Kunz density function; \(\beta\)-density function; projective toric variety; height one monomial prime ideal; convex geometry

Full Text: DOI

References:


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