

Uniform bounds in F-finite rings and their applications

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Abstract

This dissertation establishes uniform bounds in rings of prime characteristic p which are either F-finite or essentially of finite type over an excellent local ring. The uniform bounds established are used to show that the Hilbert-Kunz length functions and the normalized Frobenius splitting numbers defined on the spectrum of a ring converge uniformly to their limits, namely the Hilbert-Kunz multiplicity function and the F-signature functions. From this we establish the F-signature functions is lower semi-continuous. Lower semi-continuity of the F-signature of a pair is also established. We also give a new proof of the upper semi-continuity of Hilbert-Kunz multiplicity, a result originally proven by Ilya Smirnov.