Title: Frobenius-Poincaré Function and Hilbert-Kunz Multiplicity.

Abstract: For a prime characteristic p local domain S, the associated Hilbert-Kunz multiplicity measures singularity of S by computing the asymptotic growth of the minimal number of generators of the sequence of S-modules S^{1/p^n}. We shall discuss a natural generalization of the classical Hilbert-Kunz multiplicity theory when the underlying objects are graded. More precisely, given a prime characteristic p standard graded domain R and a finite co-length homogeneous ideal I and for any complex number y, we shall show that the limit

$$\lim_{n\to\infty} (\frac{1}{p^n})^{\dim(R)} \sum_{j=-\infty}^{\infty} \lambda \left((\frac{R^{1/p^n}}{IR^{1/p^n}})_{j/p^n} \right) e^{-iyj/p^n}$$

exists. This limiting function in the complex variable y is holomorphic everywhere on the complex plane, we name the limiting function the *Frobenius-Poincaré function.* We shall discuss properties of Frobenius-Poincaré functions, describe these functions in terms of the sequence of graded Betti numbers of $\frac{R^{1/p^n}}{IR^{1/p^n}}$. On the way, we shall mention some questions on the structure and properties of Frobenius-Poincare functions; and discuss examples to indicate the invariants of (R, I) encoded in the Frobenius-Poincaré function.