TITLE: MONOMIALIZATION OF MAPS AND MULTIVARIATE ASYMPTOTICS OF FIBER INTEGRALS

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We describe some applications of multivariate asymptotic analysis (MAA) to problems in harmonic and complex analysis. MAA is capable of describing with good precision the singular behavior of the fiber integral of an analytic mapping $F : \mathbb{R}^n \to \mathbb{R}^k$. It can therefore be understood as a natural extension of a classical technique applied to functions ($k = 1$).

The local monomialization of F is the key geometric ingredient for MAA. It is the natural analogue of local uniformization for a function, and can be used in a similar way to understand the fiber integral near the critical locus of F.

To illustrate the applications it is useful to have large classes of maps whose local monomializations are reasonably explicit. The case $k = n$ is of special interest since the critical locus is defined by a single function. As a result, Newton polyhedra can be used to describe the monomialization for generic maps.

We will then show how MAA helps to address problems of Stein and Berenstein-Yger, in particular. The first asks for an effective lower bound on p for which a certain maximal operator (associated to a nonsingular hypersurface) is bounded on $L^p(\mathbb{R}^n)$. The second asks for the largest possible class of paths over which an asymptotic approximation exists for a residue current, defined by a local complete intersection. If time permits, a third problem for which MAA is also useful will be discussed. This is the "stability of integrals" (in the sense of Phong-Stein-Sturm) within families of functions.