Transition region expansions

07.09 **Adri B. Olde Daalhuis**
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Abstract: For the normalised incomplete gamma function $Q(a,z) = \Gamma(a,z)/\Gamma(a)$ we will construct what we call *transition region expansions*, and provide full details of the inversion of these new expansions. These are expansions that are valid in the regions in which $Q(a,z)$ changes dramatically, and their coefficients are polynomials satisfying simple recurrence relations. The region of validity overlaps with those of the non-uniform "outer" expansions. Furthermore, the coefficients of their inversions are simple polynomials, whose computation and implementation are straightforward.

It is surprising to us that these transition region expansions for the normalised incomplete gamma function have not yet been discussed in the literature, given the fact that expansions of similar type for Bessel functions are well known (see §10.19.iii in the DLMF). What our new expansions and the transition region expansions for the Bessel functions have in common is that both mimic the corresponding uniform expansions.

This is a joint work with Gergő Nemes.