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Numerical analysis of minimal beta-sequences associated with a family of entire functions

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The Riemann Xi-function Xi(t)=xi(1/2+it) is a particularly interesting member of a broad family of entire functions which can be expanded in terms of symmetrized Pochhammer polynomials depending on a certain scaling parameter beta. An entire function in this family can be expressed as a specific integral transform of a function A(x) to which can be associated a unique minimal beta-sequence beta(min,n)-> infinity as n-> infinity, having the property that the Pochhammer polynomial approximant Xi(n,t,beta(n)) of order n to the function Xi(t) has real roots only in t for all n and for all beta(n)>= beta (min,n).

The importance of the minimal beta-sequence is related to the fact that its asymptotic properties may, by virtue of the Hurwitz theorem of complex analysis, allow for making inferences about the zeros of the limit function Xi(t) in case the approximants Xi(n,t,beta(n)) converge. The objective of the paper is to investigate numerically the properties, in particular the very large n properties, of the minimal beta-sequences for different choices of the function A(x) of compact support and of exponential decrease, including the Riemann case.

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