

Natural boundary for the susceptibility function of generic piecewise expanding unimodal maps

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Abstract:

We consider the susceptibility function $\Psi(z)$ of a piecewise expanding unimodal interval map f with unique acim μ , a perturbation X , and an observable ϕ . Combining previous results (deduced from spectral properties of Ruelle transfer operators) with recent work of Breuer-Simon (based on techniques from the spectral theory of Jacobi matrices and a classical paper of Agmon), we show that density of the postcritical orbit (a generic condition) implies that $\Psi(z)$ has a strong natural boundary on the unit circle. The Breuer-Simon method provides uncountably many candidates for the outer functions of $\Psi(z)$, associated to precritical orbits. If the perturbation X is horizontal, a generic condition (Birkhoff typicality of the postcritical orbit) implies that the nontangential limit of the $\Psi(z)$ as z tends to 1 exists and coincides with the derivative of the acim with respect to the map (linear response formula).