Newton's Method as a Dynamical System and as an Efficient Root Finder

Abstract:
Newton's root-finding method is as old as analysis. It is known to be an efficient method to find roots of differentiable maps once approximate starting points are known, but it has a reputation of being hard to control from a global point of view. When applied to a complex polynomial in one complex variable, Newton's method is the iteration of a rational map; we investigate this from the point of view of holomorphic dynamics. We show how the global dynamics of Newton's method can be understood so as to yield a fast algorithm to factorize complex polynomials efficiently.

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