INSTITUTUL DE MATEMATICA "SIMION STOILOW" AL ACADEMIEI ROMANE

A superquadratic variant of Newton's method

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Abstract: We present the first Q-superquadratically convergent version of Newton's method for solving operator equations in Banach spaces that requires only one operator value and one inverse of the Fréchet derivative per iteration. The R-order of convergence is at least 2.4142. A semi-local analysis provides sufficient conditions for existence of a solution and convergence. The local analysis assumes that a solution exists and shows that the method converges from any starting point belonging to an explicitly defined neighbourhood of the solution called the ball of attraction.