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A UNIFYING THEOREM ON NEWTON'S METHOD IN A BANACH SPACE WITH A CONVERGENCE STRUCTURE UNDER WEAK ASSUMPTIONS

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Abstract. We provide a semilocal analysis for Newton's method on a Banach space with a convergence structure. Our main result contains as special cases earlier results on semilocal theorems of Newton–Kantorovich-type as well as global results based on monotonicity. It turns out that under the same hypotheses our sufficient convergence conditions are weaker and the error bounds on the distances involved finer than before. Some numerical examples are provided to show that our results apply where others fail.

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Key Words and Phrases. Newton's method, Banach space with a convergence structure, order convex operator, Newton–Kantorovich hypothesis, monotone convergence, multilinear/bounded/symmetric operator.

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