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15. Numerical Analysis and Scientific Computing

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Root-finding Inclusion Algorithms Based on Tangential Lines and Parabolas

For solving real non-linear equations of the form $f(x) = 0$, three iterative algorithms are given. They are based on Newton's method and the always convergent method of tangential parabolas. Each of our combined procedures generates a decreasing sequence of real, compact intervals with

a.) each member of the sequence contains the zero of the non-linear twice differentiable function f;

b.) the sequence of diameters of the intervals tends to zero;

c.) the diameters obey a quadratic à posteriori error estimation.

In terms of error estimations, the parabola-parabola method is better than the other two combined algorithms. Some illustrative numerical examples are given, together with the algorithmic descriptions of our combined inclusion methods. Reference: Z. Szabó, Newton-Parabola Combined Method For Solving Equations, *Comput. Appl. Math. I. Algorithms and Theory*, pp.447-452. Elsevier Science Publishers,1992, IMACS.