

Multiparameter, symmetric, symplectic exponentially-fitted Runge-Kutta-methods of Gauss-type

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In recent years, several authors (Van de Vyver; the Zaragoza group of Calvo, Montijano, Randéz, Franco; the Ghent group of Vanden Berghe, Van Daele, Hollevoet), have reported on the construction of exponentially-fitted symplectic Runge-Kutta methods of Gauss type. The newly constructed methods have in common that they produce exact results whenever the solution belongs to some fitting space, which consists of a polynomial part and a parameter dependent exponential part, but they differ in the choice of the polynomial part : Calvo et al. choose for a space determined by

$$\{\exp(\pm\mu x), \exp(\pm 2\mu x), \exp(\pm 3\mu x), \dots\}$$

whereas Vanden Berghe et al. consider the set

$$\{\exp(\pm\mu x), x \exp(\pm 2\mu x), x^2 \exp(\pm 3\mu x), \dots\}.$$

In this talk, we will consider multiparameter methods that rely on the set

$$\{\exp(\pm\mu_0 x), \exp(\pm\mu_1 x), \exp(\pm\mu_2 x), \dots\}.$$

With this choice, we create a class of methods that incorporates both the already existing classes of methods.

The talk will be focussed in particular on the construction of 2-stage and 3-stage methods with two parameters. Some numerical results will be presented.