

Runge-Kutta schemes for the numerical solution of linear inhomogeneous IVPs

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Runge-Kutta methods for the numerical solution of inhomogeneous linear initial value problems with constant coefficients [1], [2] is considered.

A general procedure to construct explicit s -stage RK methods with general order s depending on the nodes $c_i, i = 1, \dots, s$ is presented. This procedure only requires the solution of successive linear equations in the elements of the matrix \mathbf{A} and avoids the solution of non linear equations.

Finally, we present several RK schemes with number of stages $s = 5, \dots, 8$ and maximal order $p = s$ for the class of problems under consideration.

References

- [1] T. E. Simos and Ch. Tsitouras: “Evolutionary derivation of Runge-Kutta pairs for addressing inhomogeneous linear problems”. *Numerical Algorithms* (2020): 87(2), 1–15. DOI:10.1007/s11075-020-00976-9
- [2] D. W. Zingg and T. T. Chrisholm: Runge-Kutta methods for linear ordinary differential equations. *Applied Numer. Math.* 31, 227–238 (1999).