# Computer derivation of numerical methods

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**Abstract** Mathematica V3.0 has unique capabilities aimed at the construction and analysis of numerical methods. This is particularly emphasised in the area of numerical solutions of ordinary differential equations [2, 3]. Here we review the traditional approach to the construction of Runge-Kutta type methods and illustrate its limitation. Next we discuss how a modern formalism can be automated and how to obtain computer based proofs of existence and non-existence. Then we demonstrate how new classes of such methods, built on top of the standard formalism, can be derived [1, 4]. Finally we present a unique tool for the stability analysis of certain types of numerical methods. We illustrate how a shift in frameworks leads us to examine numerical schemes as approximants of functions in the complex plane.

## References

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