On the long time error of first integrals of some numerical integrators

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Abstract

The aim of this paper is to show the behaviour of several Runge–Kutta methods for some test problems on long term integrations and to give an explanation of this behaviour. The growth of the error in the first integrals of ODEs that possess periodic orbits for general RK methods is studied. The behaviour of geometric numerical integrators, symplectic and pseudo–symplectic, is analised and a number of numerical experiments that illustrate the results are presented.