An algebraic approach to conservation of first integrals in numerical integration

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We present an algebraic approach to the exact preservation of first integrals in terms of the series expansions of the numerical integrators. We also explore the existence of modified first integrals, which explains the near preservation of first integrals observed in some cases. We first consider results obtained for B-series and P-series methods (a joint work with Philippe Chartier and Erwan Faou), and then show how to extended our approach to very general classes of numerical integrators.