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Title: Resonances in extreme mass-ratio inspirals: asymptotic and hyperasymptotic analysis.

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Review text:

There are two main ingredients in this paper coming, with equal weight, from mathematics [of solving nonlinear ordinary differential equations of the form $y' = f(xy)$ using truly tricky asymptotic and hyperasymptotic expansions in a consequent and systematic manner] and from general relativity physics [typically, of a gravitational radiation by a massive compact object (such as a neutron star) orbiting around a supermassive object (such as a black hole) and forming the so called extreme-mass-ratio "inspiral" (EMRI)]. In a way inspired by Ref. [2] (where $f(xy)$ was chosen as $\cos xy$) and by Refs. [13] and [14] (where $f(xy)$ was chosen as $\tan 2xy$) the authors study the EMRI resonances as described by $f(xy) = 1 + k \cos xy$ (frequency resonances) or by $f(xy) = 1 + k \cos \int y\, dx$ (phase resonances), both in the alternative dynamical regimes controlled by parameter $k - 1$. In both cases the asymptotic approximation analytic predictions are shown to compare well with the brute-force numerical solutions. Possible realistic amendments of $f(xy)$ are also discussed.