An analytic function expansion approach to computing pertur-bations from extreme-mass-ratio binaries with eccentric orbits CHARLES EVANS, ERIK FORSETH, University of North Carolina, Chapel Hill, SETH HOP-PER, University College Dublin — Several groups (Fujita 2012; Shah, Friedman, and Whiting 2014; Shah 2014; Fujita 2014) have recently described results from comput-ing gravitational perturbations and the self-force at extraordinarily high precision for binaries with circular orbits in the extreme-mass-ratio limit. These calculations have allowed comparison with post-Newtonian (PN) theory at the lowest order in the mass ratio and uncovered new terms and coefficients in the PN expansion for circular orbits. We describe a new means of extending this analytic function expan-sion approach to include binaries with eccentric orbits, thus allowing terms in the known 3PN order expansion to be verified and to discover new terms beyond 3PN.

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