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**Ovidiu Costin, Rodica Costin and Kriti Sehgal\*** (sehgal.50@osu.edu). *Mathematics behind the dynamics of the Hénon-Heiles system.*

The Hénon-Heiles system originated in the work of Michel Hénon and Carl Heiles while studying the non-linear motion of a star around a galactic center restricted to a plane. There are several results suggested by numerical experiments about the dynamics of this system. Numerical results display periodic solutions when the Hénon-Heiles Hamiltonian is less than  $1/6$ .

We aim to create a rigorous mathematical theory that would either prove or disprove the above results. We are using series expansions to find the concrete formulas for the variables. We have succeeded in finding the formulas up to second order of series expansion and they agree with numerics with high precision. We do not see any difficulty in going to third order of the series expansion similarly. The theory would serve the twofold purpose of adding mathematical rigor to already known numerical results and to understand more about the qualitative features of the solutions. (Received August 15, 2020)