

A family of comets in the 3-body problem

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Abstract:

We will consider the Newtonian three-body problem with equal masses. In particular, we will look at the family of curves that have collinear initial position and, after a given time, end up in an isosceles configuration with a fixed amount of rotation. For small angles of rotation, we obtain the classic comet orbit whose existence has historically relied on a limiting argument. Using variational arguments, which are more global in nature than limiting arguments, we find a family of periodic orbits extending from the extreme "comet" case to orbits in which the "comet" passes close to both primaries. All of these orbits have the same topology and they can be deformed into one another without passing through collision, which will be illustrated on the shape sphere.