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Inverse Problem of Central Configurations in the Collinear 5-body Problem.

The n-body problem is as old as physics itself. It was Isaac Newton's fascination with calculating the motion of the Earth, sun, and moon that lead him to his discoveries in both physics and calculus. While Poincare discovered the chaos of the three body problem, mathematicians have found ways to analyze the n-body problem by studying central configurations where the bodies can remain their shape in their orbits. The inverse problem of collinear central configurations has been studied in the collinear 3-body problem by Albouy and Moeckel in 2001 and in the collinear 4-body problem by Ouyang and Xie in 2004. In our research, we examine the collinear 5-body problem by solving for the masses with the positions as given variables. Through this process, we can determine possible positions for central configurations. In the symmetric case, it is surprising that any symmetric configuration could be a central configuration for some positive masses, which is different from the symmetric case for collinear 4-body central configurations. In general, we identify regions in the configuration space where it is possible to choose positive masses that will make the configuration central. Mathematical software Geogebra, Maple, and SageMath have been used to compute and plot the regions. (Received September 25, 2017)