CCSU

DEPARTMENT OF MATHEMATICAL SCIENCES

COLLOQUIUM

Friday, October 20

3:15 – 4:15 PM

Maria Sanford, Room 101

LAGRANGE POINTS OF EULER'S SOLUTIONS OF THE THREE-BODY PROBLEM

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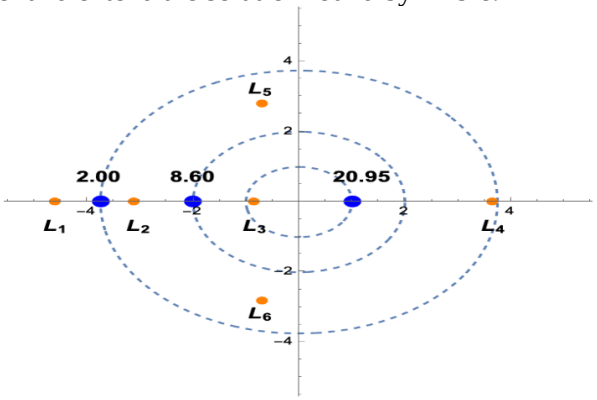
Abstract: The restricted n+1 body problem refers to solutions of the (n+1)-body problem where one of the masses is so small that its presence does not affect the motion of the other n bodies. Here we are assuming that the only force acting on the bodies is the gravitational force.

The well-known Lagrange points are circular solutions of the restricted 2+1 body problem where the two massive bodies move along concentric circles. We will call these solutions the classical Lagrange points.

In 1765, Leonhard Euler (1707-1783) showed that the relative distances among three collinear bodies that move on concentric circles and are solutions of the three-body problem satisfy a quintic equation. Essentially, Euler found a 2-parametric family of solutions for the three-body problem.

Recently, in 2023, Jaume Llibre found the Lagrange points (circular solutions of the 3+1 body problem) in the case where (i) two of the massive bodies move in the same circle, (ii) the third body stays in the center of the mass of the other two bodies and (iii) the masses of the three bodies are the same. Llibre found the Lagrange point of one of the solutions found by Euler.

In this talk we deduce Euler's solution of the three body-problem, we explain how to use these solutions to compute the classical Lagrange points L1, L2 and L3, and finally we discuss the Lagrange points for Euler solutions, in particular, we recover and extend the solution found by Llibre.



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