

Restricted Three-Body Problems and the Non-Regularization of the Elliptic Collision Restricted Isosceles Three-Body Problem

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1. INTRODUCTION

The main problem in Celestial Mechanics is the so called *n-body problem*, i.e. to describe the motion of n point particles of positive mass moving under Newton's law of gravitation when we know their positions and velocities at a given time.

The two-body problem is completely solved in the sense that we can describe explicitly all its solutions. For $n \geq 3$ we have many partial result about the *n-body problem*, but we are far to understand all its solutions.

A *restricted three-body problem* consists in describing the motion of a massless particle m_3 under the gravitational action of two positive masses m_1 and m_2 , called *primaries*. Since m_3 does not perturb the motion of the primaries, then these are moving following a solution γ of the two body problem. Then we call this particular restricted three-body problem the γ restricted three-body problem.

In Section 2 we prove that there are exactly 30 different restricted three-body problems in dimension 1, 2 and 3. At least 10 of these problems have been studied by several authors.

The rest of the paper is dedicated to study the *elliptic collision restricted isosceles three-body problem*, i.e. the restricted three-body problem when the

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