



# Seminari Informal de Matemàtiques de Barcelona

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**Speaker:** José Lamas Rodríguez.

**University:** Universitat Politècnica de Catalunya.

**Date:** Wednesday, May 22nd, 2024.

**Schedule:** 13:00, *coffee break*; 13:20, talk.

**Place:** UPC (FME aula 103) and Zoom.

**Language:** English.

**Title:** Collision leading to chaos in the restricted 3-Body Problem

**Abstract:** We consider a very important problem in the field of celestial mechanics, called the restricted planar circular three-body problem. In this setup, we are examining how a small, massless object moves under the gravitational influence of two larger bodies, which are orbiting each other in circular trajectories around a common center. When we look at this problem in the right mathematical framework, we find that it is governed by what are called Hamiltonian dynamics, which essentially means that energy is conserved. This energy is often referred to as the Jacobi constant. For our interest, we will focus on the so called ejection-collision orbits. These are trajectories where the small object starts off near one of the bigger bodies, gets flung out into space for a while, and then comes crashing back into it. We are going to explore how we can create these orbits, especially when the masses involved are really lopsided. We introduce some mathematical concepts, like the stable and unstable manifolds, which help us understand where these orbits come together. Essentially, we are going to show that for certain conditions, there are points where the trajectories of these orbits intersect in a particular way, leading to different kinds of behaviour.

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**About us:** *SIMBa* is a mathematics seminar organized by graduate students in the Barcelona area. It is aimed towards graduate and last course undergraduate students. Our goals are disseminating knowledge from different branches of mathematics for those interested and promoting networking between the attendants.

This seminar is backed by the Faculty of Mathematics and Computer Science at Universitat de Barcelona, Faculty of Mathematics and Statistics at Universitat Politècnica de Catalunya,

the Department of Mathematics from Univesitat Autònoma de Barcelona, CRM, IMUB and BGSMath.

Fore more information, visit [seminari-simba.github.io/en](https://seminari-simba.github.io/en). You may contact us by sending an email to *[seminari.simba@gmail.com](mailto:seminari.simba@gmail.com)*.