

On the central configurations of the planar 1 + 3 body problem

Montserrat Corbera · Josep Maria Cors · Jaume Llibre

Received: 2 November 2009 / Revised: 7 September 2010 / Accepted: 13 September 2010 /
Published online: 15 October 2010
© Springer Science+Business Media B.V. 2010

Abstract We consider the Newtonian four-body problem in the plane with a dominant mass M . We study the planar central configurations of this problem when the remaining masses are infinitesimal. We obtain two different classes of central configurations depending on the mutual distances between the infinitesimal masses. Both classes exhibit symmetric and non-symmetric configurations. And when two infinitesimal masses are equal, with the help of extended precision arithmetics, we provide evidence that the number of central configurations varies from five to seven.

Keywords 1 + 3 body problem · Central configurations · Coorbital satellites

1 Introduction

We study configurations with one massive central mass and several infinitesimal coorbital satellites describing the same circular orbit around the central massive mass. Such configurations are called *relative equilibria*, because in a rotation frame the satellites remain fixed. Recently these configurations have attracted the attention of astronomers.

M. Corbera
Departament de Tecnologies Digitals i de la Informació, Universitat de Vic,
Laura 13, 08500 Vic, Barcelona, Catalonia, Spain
e-mail: montserrat.corbera@uvic.cat

J. M. Cors (✉)
Matemàtica Aplicada III, Universitat Politècnica de Catalunya,
08242 Manresa, Barcelona, Catalonia, Spain
e-mail: cors@epsem.upc.edu

J. Llibre
Departament de Matemàtiques, Universitat Autònoma de Barcelona, Bellaterra,
08193 Barcelona, Catalonia, Spain
e-mail: jllibre@mat.uab.cat