

# Remarks on Lagrangian singularities, and minimum distance lines in Hamiltonian systems

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## Abstract

We review some classic examples of caustics and Lagrangian singularities connected with the geometric problem of minimum distance to the boundary of a compact convex set. In a different setting, we wish to study the stability properties of periodic orbits of fixed energy, for a hamiltonian system of kinetic plus potential type. We review the classic Jacobi metric construction for the variational formulation of this problem in a bounded domain of configuration space. We introduce and explain the connection of certain families of periodic orbits, and the question of their stability type, with the problem of determining the set of Lagrangian singularities. This approach to stability can be adapted to other problems in classical theory of homographic solutions of the N-body problem. We conclude with an example from the planar parallelogram four body problem.

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