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Lyapunov stability for some central forces. (English) Zbl 0668.34051
J. Differ. Equations 74, No. 2, 254-265 (1988).

Consider the system (*): $\ddot{x} + xf(x) = 0$, $\ddot{y} + yf(x) = 0$, where $f \in C^0(A, \mathbb{R})$, $0 \in A = \overset{\circ}{A} \subset \mathbb{R}$. If $f(0) > 0$ then the force is attractive and one could think that the stability always occurs as in the conservative case. This naive conjecture is false as proved by A. Barone and the author in the paper Attractive central forces may yield Lyapunov instability. Proceed. VII ELAM, Equinoccio, Caracas, 1986, 105-112. They find more than only an example for this conjecture, and obtain large classes of f for which instability occurs and they completely solve the stability problem for f even: the equilibrium is then stable only in the trivial case, i.e. whenever f is locally constant at zero and $f(0) > 0$. Is stability possible just in the trivial case? The answer to this question is negative. The aim of this paper is to determine and construct all the continuous maps f such that the origin is a stable equilibrium for the system (*). This paper gives also a different proof of results on stability using an integral equation similar to Abel's equation, and introduce some results on the unstable cases.

Reviewer: [Chungyou He](#)

MSC:

[34D20](#) Stability of solutions to ordinary differential equations

Cited in **2** Reviews
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Keywords:

[central forces](#); [Abel's equation](#)

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