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Canonical Constants in a Problem of Radzievskij

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SUMMARY

V. V. Radzievskij [4] investigated the motion of two point masses inside a homogeneous spherical cloud, assuming that the mutual interactions between these masses and between them and the particles of the cloud are described by their Newtonian gravitational attractions. In addition to this, the constant density of the cloud is supposed to be sufficiently small so that the resistance of this material medium to the motion can be neglected.

The problem of relative motion of the said point masses can be brought into the form of a perturbed Keplerian system, in which the perturbing force is a conservative central force. With the help of the first integrals of the angular momentum and the energy, this author followed the conventional solution procedure in plane polar coordinates, formally leading to an orbit equation (in inverted form), $\varphi = \varphi(r\,;r_0\,,\varphi_0)$, in terms of *an Abelian integral.*

D. Mihailović tackled different analytical treatments of Radzievskij's problem: reading it as a perturbed Kepler problem ([1], [2]) he used vector elements and the corresponding perturbation equations, in line with the developments of the Milanković School of Analytical and Celestial Mechanics; regarding the problem as a forced harmonic oscillator ([3]), he resorted to the method of variation of arbitrary constants to study a particular solution to the second–order non–homogeneous linear differentiall equation governing that oscillator.

In this talk *we introduce canonical constants and orbital elements for this problem.*

Keywords: Radzievskij's three–body problem, perturbed Keplerian systems, conservative central force, first integrals, canonical constants of motion.

AMS Classification: 70 F 05, 70 H 15, 70 H 20

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