

ON CERTAIN FUNCTIONAL SOLUTIONS OF THE SATELLITE PROBLEM OF THREE BODIES.

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Henri Poincaré complains in various passages of his classical *Méthodes Nouvelles de la Mécanique Céleste* 1) of a serious difficulty we always encounter when trying to apply the theory of periodic orbits to concret astronomical problems.

The fundamental determinant, namely the Hessian—Jacobi—Poincaré 2), disappears identically just in the cases in which celestial mechanics is most interested. I refer especially to the all important example of the general problem of three bodies.

And as a matter of fact the vanishing determinant causes the necessary periodic solutions to remain unattainable, as it renders every possibility of their detection futile.

This makes the very known solutions too scarce and far between. And so it happened that for a long time all theoretical efforts resulted in the general belief that the most needed periodic solutions did not exist at all.

Poincaré himself puts it clearly as follows 3):

With every other law than that of Newton, which uses the second power of the reciprocal distance, we meet with lesser difficulties when trying to solve the problem of three bodies. (Donc avec une loi différente de la loi Newtonienne on ne rencontrerait plus dans la recherche des solutions périodiques du problème des trois corps la difficulté que je viens de signaler.) Many years ago I tried to overcome the aforesaid difficulty 4). With this object in view I generalized a substitution — which although very well known even to Poincaré himself was never rightly appreciated for the purpose in question.

And, indeed, by using this infinitesimal transformation and introducing small parameters I succeeded in attaining another Jacobians. The trial always results in the possibility of suppressing a single zero factor (which represents the small parameter of the disturbing mass) of the determinant.