of the new theory of unpredictable functions have been lied in the present research. Automatically, the results concerning the analyses of functions and sequences make it possible to formulate new problems of the existence of unpredictable solutions for differential equations of different types as well as for discrete and hybrid systems of equations, similar to the results for periodic, almost periodic and other types of solutions. These are all strong arguments for the insertion of chaos research to the theory of differential equations. In addition to the role of the present paper for the theory of differential equations, the concept of unpredictable points and orbits introduced in our studies [2, 3] and the additional results of the present study will bring the chaos research to the scope of the classical theory of dynamical systems. Moreover, not less importantly, these concepts extend the boundaries of the theory of dynamical systems significantly, since we are dealing with a new type of motions, which are behind and next to Poisson stable trajectories. From another point of view, our study requests the development of techniques to determine whether a point is an unpredictable one in concrete dynamics. For that purpose one can apply the research results which exist for the indication of Poisson stable points [4]. One more interesting study depending on the present results can be performed if one tries to find a numerical approach for the recognition of unpredictable points.

References

[1] Poincaré H. Les Methodes Nouvelles de la Mecanique Celeste. Vol. III, Paris, 1899; reprint, New York: Dover; 1957.

[2] Akhmet M, Fen MO. Unpredictable points and chaos. Commun Nonlinear Sci Numer Simulat 2016;40:1–5.

[3] Akhmet M, Fen MO. Existence of unpredictable solutions and chaos. Turk J Math, doi:10.3906/mat-1603-51 (accepted).

[4] Shilnikov L. Homoclinic chaos. In: Infeld E, Zelazny R, Galkowski A, editors. Nonlinear Dynamics, Chaotic and Complex Systems, Cambridge: Cambridge University Press; 1997, p. 39–63.

[5] Devaney RL. An Introduction to Chaotic Dynamical Systems. United States of America: Addison-Wesley Publishing Company; 1987.

[6] Lorenz EN. Deterministic non-periodic flow. J Atmos Sci 1961;20:130–141.

[7] Li TY, Yorke JA. Period three implies chaos. Am Math Mon 1975;82:985–92.

[8] Sell GR. Topological Dynamics and Ordinary Differential Equations. London: Van Nostrand Reinhold Company; 1971.

[9] Akhmet MU. Shadowing and dynamical synthesis. Int J Bifur Chaos 2009;19:3339–46.