Analytic tools for proving of chaos in dynamical models

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Abstract. In this talk I will speak about theoretical properties of chaotic behaviour of dynamical systems that can be established analytically in specific systems. The first such theoretical result was the Shilnikov's theorem about the complicated structure of trajectories near a homoclinic orbit to saddle-focus. In 1968 he proved existence of infinitely many of Smale's horseshoes in such a bifurcation. Also he described a spiral attractor, which is also called Shilnikov attractor, and conjectured that it should be born near such loops.
Another chaotic object that is well-known for the dynamical systems theory is the Lorenz attractor. However, it took some decades to make a positive answer about the existence of such an attractor in the Lorenz system itself. I am going to present the series of results that allow prove existence of Lorenz-like attractors in systems with continuous and discrete time.