

# Dynamical Systems and Iteration Theory

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Dynamical system theory is to investigate substantial rules of motion, concerning not only existence and stability of basic motions such as equilibria and periodic motions but also topological structure of trajectories of those motions. It emphasizes structural stability of those motions and their qualitative changes under perturbation. Continuous motions described by differential equations and discrete motions described by iterated mappings both belong to the category of dynamical systems. In addition to practical senses of the two different kinds of motion, we need to know their intrinsic connection, i.e., how to discretize a continuous dynamical system and, conversely, how to embed a discrete dynamical system to a continuous one. Studying iteration of mappings, we show complicated motions generated from a simple mechanics and find rules behind those complicated phenomena. This course contains iteration and invariant sets, iterative roots and embedding flows, and periodicity and bifurcations.