AME 630: Transition to Chaos in Dynamical Systems
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Spring 2021
Time: M,W 12:00-1:50, GFS 118 & ONLINE

The course will focus on the main ideas and techniques in dynamical systems and chaos theory by introducing examples that have served as useful prototypes. There are 4 parts to the course:

1. Review of basic dynamics
2. Iterated maps
3. Bifurcation theory
4. Evolutionary games

Part 1 will briefly survey some of the main ideas of basic dynamics including phase space techniques, fixed points, stability theory, Lyapunov functions. Part 2 focuses on the dynamics of iterated maps, the simplest setting in which chaotic behavior can occur. This will lead to a discussion of bifurcation phenomena, Feigenbaum scaling theory and Lyapunov exponents in prototype maps such as the logistic map, the ‘standard’ map, and the Hénon map. Part 3 will outline basic techniques of bifurcation theory related to differentiable dynamics, including discussions of center manifolds, unfolding a bifurcation, and the Hopf bifurcation. Part 4 will focus on the dynamics of evolutionary games using the replicator equations and the prisoner’s dilemma game.

Books: