

MCS 590, Spring 2009

Homework 1

Rössler attractor is a chaotic dynamical system with 3 variables, similar to the Lorenz “butterfly”. The Rössler attractor is given by the following system of equations:

$$\begin{aligned}\dot{X} &= -(Y + Z), \\ \dot{Y} &= X + aY, \\ \dot{Z} &= b + Z(X - c),\end{aligned}\tag{1}$$

where $X(t), Y(t), Z(t)$ are variables, and a, b, c are constant parameters.

1. Find fixed points and determine type and linear stability of fixed points for the Lorenz “butterfly” with $\sigma = 10, r = 28, b = 8/3$
2. Find fixed points and determine type and linear stability of fixed points for the Rössler attractor with $a = 0.2, b = 0.2, c = 5.7$
3. Write down the tangent map equation for both Lorenz “butterfly” and Rössler attractor

You can use octave/matlab/maple to compute the eigenvalues of the Jacobian.