

# Dynamical Systems Homework:

## Rossler attractor

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The Rossler Attractor is a three-dimensional system, with three parameters, a, b, and c, and three state variables, x, y, and z. The differential equations that define the system are as follows:

$$\begin{aligned}\frac{dx}{dt} &= -y - z \\ \frac{dy}{dt} &= x + ay \\ \frac{dz}{dt} &= b + z * (x - c)\end{aligned}$$

I chose this system because I wanted to learn more about chaotic systems. The system, based on my observation and what I read has two fixed points. There is one that is in a basin of attraction which the system seems to spool around on the bottom there, and another repeller which is outside of the regular system paths. When I change c from 14 to 25 the point seems to be pulled in faster and the rings around the edge dont sem to be as thick indicating that the system has gone around the basin of attraction fewer times. taken together, I wonder if this means that the basin of attraction gets bigger or smaller as a function of c.

Fig. 1 shows the phase portrait of the system for the parameter values a = .1 , b = .1, c = 14, and initial condition (0,1,2).

Fig. 2 shows the phase portrait of the system after c has been changed to 25.

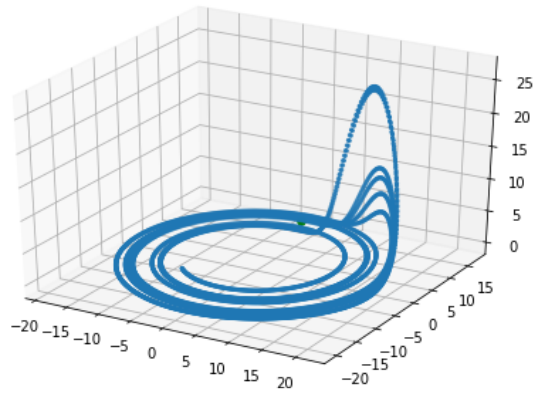


Figure 1: The Rossler attractor for  $c = 14$ .

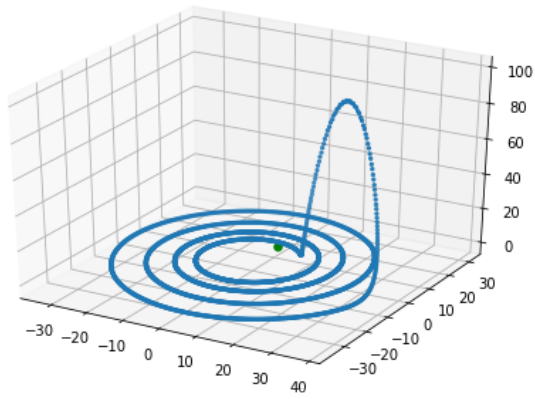


Figure 2: The Rossler attractor for  $c = 25$ .