DEPARTMENT OF MATHEMATICS
MATHS 761 Laboratory 6 notes

The following systems are all structurally unstable. Investigate the dynamics using any methods available to you, and find an arbitrarily close system which is not topologically equivalent. Plot phase portraits (by hand or with XPP) of both the original system and your new system, and explain why they are not topologically conjugate.

1.

$$\begin{aligned} \dot{x} &= y, \\ \dot{y} &= x^2. \end{aligned}$$

2.

$$\begin{aligned} \dot{x} &= \sin y, \\ \dot{y} &= \cos x. \end{aligned}$$

3.

$$\begin{aligned} x_{n+1} &= 3 - y_n - x_n^2, \\ y_{n+1} &= x_n. \end{aligned}$$

4.

$$\begin{aligned} \dot{x} &= x(1 - x^2 - 2y^2 - \tfrac{1}{2}z^2), \\ \dot{y} &= y(1 - y^2 - 2z^2 - \tfrac{1}{2}x^2), \\ \dot{z} &= z(1 - z^2 - 2x^2 - \tfrac{1}{2}y^2). \end{aligned}$$