

Exercise Sheet 1

April 27, 2015

Exercise 1. *Tutorial*

Consider the system of differential equations

$$\begin{aligned}\dot{x} &= x^2 - y \\ \dot{y} &= x + y\end{aligned}$$

- Determine the nullclines and the critical points.
- For each critical point, determine the Jacobi matrix and its eigenvalues.
- What does this imply for the type of the critical points?
- Sketch a phase portrait.

Exercise 2. *Tutorial*

Consider the system of differential equations

$$\begin{aligned}\dot{x} &= x^2 - 1 \\ \dot{y} &= 2y\end{aligned}$$

- Determine the nullclines and the critical points.
- For each critical point, determine the Jacobi matrix and its eigenvalues.
- What does this imply for the type of the critical points?
- Sketch a phase portrait.

Exercise 3. *Tutorial*

Consider the system of differential equations

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

- Determine the nullclines and the critical points.

- b) For each critical point, determine the Jacobi matrix and its eigenvalues.
- c) What does this imply for the type of the critical points?
- d) Sketch a phase portrait.

Exercise 4. *Homework*

4 P.

Install Xpp. Draw the phase portraits for the second and the third example (including nullclines, direction field and flow), keep track of what you did.

Send the phase portraits and their recipes until Friday, 1st, 10:00 a.m. to **Therese.Lorenz@fu-berlin.de**.