

Exercise Sheet 5

1. Center Manifold

Consider the equations

$$\begin{aligned}\dot{x} &= \epsilon x - x^3 + x^2 y \\ \dot{y} &= -y + y^2 + xy - x^3\end{aligned}$$

1. Analyze the fixed point $(0, 0)$ via linear stability analysis.
2. Distinguish between fast and slow variables and determine for $\epsilon = 0$ the center manifold. To this end use a polynomial series up to order three as ansatz.
3. Compare the different orders of the approximation with the real phase flow for $\epsilon = 0$.