Exercise Sheet 4

1 Satbility analysis in two dimensions

Consider the system

$$\dot{x} = y - y^3$$
$$\dot{y} = -x - y^2$$

1. Determine the fixed points.

2. Analyze the stablity of the fixed points and classify them.

2 Oscillating chemical reaction - the Brüsselator

The Brüsselator is a simple model of an oscillating chemical reaction. In dimensionless form the dynamics of the reaction can be written as

$$\dot{x} = 1 - (b + 1)x + ax^2y$$
$$\dot{y} = bx - ax^2y\,.$$

With the parameters $a, b > 0$ and the dimensionless concentrations $x, y \geq 0$.

1. Find all fixed points and classify them via linear stability analysis.

2. Find the critical value b_c and determine the type of bifurcation.