TMA4165 - Project

This project is required to be admitted to the oral exam. The project presentation consists of plotting 1 phase portrait out of the 6 given below and explaining how it has been obtained and what can be deduced from it. The phase portrait is chosen by the exercise teacher at the time of the presentation, so you have to be prepared to present all of them. The presentation is to be done without any help from notes/books etc. The project is just a precondition for the exam and does not count towards the grade.

Sign up for a time to present the project here. The deadline for signing up is 10.04.

Problems

In these problems sketching the phase portrait includes:

- Locate all equilibria;
- classify the equilibria according to Table 2.1 in the book (Schaeffer & Cain);
- sketch the nullclines;
- indicate the regions where x and y are increasing/decreasing;
- sketch the stable and unstable manifolds of the equilibria;
- indicate a few other trajectories.

Sketch the phase portrait for the following equations:

(i)

$$\begin{aligned} x' &= -2x(x-1)(2x-1), \\ y' &= -2y; \end{aligned}$$

(ii)

$$\begin{aligned} x' &= x(4-2x-y), \\ y' &= y(3-x-y); \end{aligned}$$

(iii)

$$\begin{aligned} x' &= x(60-4x-3y), \\ y' &= y(42-3x-2y); \end{aligned}$$

(iv)

$$\begin{aligned} x' &= 2x - xy, \\ y' &= 2xy - y^2 - 2y; \end{aligned}$$

(v)

$$\begin{aligned} x' &= -x(2-x^2-y^2), \\ y' &= -y(1+x^2+y^2-3x); \end{aligned}$$

(vi)

$$\begin{aligned} x' &= \sin(x)\cos(y), \\ y' &= \sin(y)\cos(x). \end{aligned}$$