

MATH 489, Section C14, HW 6. Due date: 05/06/09.

Problem 1

Describe the phase portrait of

$$\begin{aligned}x' &= x^2 - 1 \\y' &= -xy + a(x^2 - 1)\end{aligned}$$

when $a < 0$. What qualitative features of this flow change as a passes from negative to positive?

Problem 2

Consider the system

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

Show that the origin is not asymptotically stable when $\epsilon = 0$. Show that when $\epsilon < 0$, the basin of attraction of the origin contains the region $z > -1$.