

MATH 489, Section C13, HW 7. Due date: 05/06/09.

For each of the following two nonlinear systems, sketch the x - and y -nullclines and use this information to determine the nature of the phase portrait.

Problem 1

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

Problem 2

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

Problem 3

Find a Liapunov function for the equilibrium point $(0, 0)$ of

$$\begin{aligned}x' &= y \\y' &= -x - y^3\end{aligned}$$

and determine its stability.