

Math 250b (Spring '08) - Homework 13

PART I: This is the stuff that will be on the third exam.

1. For each of the following three autonomous non-linear systems,
 - (i) Find all the equilibrium points.
 - (ii) Find the linear systems that approximate the original system near each equilibrium.
 - (iii) State what you can conclude from the linearization theorem for each equilibrium in the original system.
 - (iv) Use P-Plane to plot a bunch of trajectories and then print it and indicate on the plot where the separatrices are.

(a)

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

(b)

$$\begin{aligned}x' &= y^2 - x^2 \\y' &= 2 - e^x\end{aligned}$$

(c)

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