

HOME WORK 4 : MATH 490, Fall 2008

Due in class on Nov 26, Wed

Show your reasoning clearly in logical order.

- Q1** Find the equilibria of the following system. Find values of μ for which any of the equilibria may undergo a bifurcation. What kind of bifurcation occurs when $\mu = 0$ around the only equilibrium?

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

- Q2** Find conditions on a, b, c and d in order for the equilibrium $(0, 0)$ of the following system to have a saddle-node bifurcation as μ crosses 0 (a, b, c being fixed).

$$\begin{aligned}\dot{x} &= ax^2 + \mu(b + cx) \\ \dot{y} &= -y + \mu dxy\end{aligned}$$

- Q3** Determine the equilibrium points and the bifurcations if any (as μ is varied) for the system

$$\begin{aligned}\dot{x} &= -x^4 + 5\mu x^2 - 4\mu^2 \\ \dot{y} &= -y\end{aligned}$$