

THIS IS A GROUP HOMEWORK ASSIGNMENT!

1. Consider the system

$$\begin{cases} x' &= -x^3 + x - y \\ y' &= \varepsilon(y - 2x + a) \end{cases}$$

where a is parameter and ε is a small number. Identify the fixed points of the system, investigate the stability of each, and explain in broad outline the dynamics of the system for $a = 0$, $a = 2$, and $a = -2$ for ε positive and negative (for example, you may use $\varepsilon = \pm .01$ if you want a specific numbers).

2. Consider the system

$$\begin{cases} x' &= -x^3 + x - y \\ y' &= \varepsilon(y - 2x^2 + x + a) \end{cases}$$

where a is parameter and ε is a small number. Identify the fixed points of the system, investigate the stability of each, and explain in broad outline the dynamics of the system for $a = -1$, $a = 0$, $a = 1$, and $a = 3$ for ε positive and negative (for example, you may use $\varepsilon = \pm .01$ if you want a specific numbers).