

**Homework 3: MATH 490C / BIOL 595N, Due Wednesday, 2/1**

THIS IS A GROUP HOMEWORK ASSIGNMENT.

1. Consider the system

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

where  $a$  is a parameter and  $\epsilon$  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  $a = -1$ ,  $a = 0$ , and  $a = 3$  for  $\epsilon$  positive and negative (for example, you may use  $\epsilon = \pm.01$ ).

2. Read section 4.4 of <http://www.wam-bamm.org/Tutorials/BoG/chapt4.pdf>. Write one paragraph for each of figures 4.4 and 4.5 describing in words the content of the picture and how it relates to the Hodgkin-Huxley model. Write an addition paragraph describing strengths and weaknesses of the method used to develop the Hodgkin-Huxley model as described in section 4.4.