**Homework # 2**
**Due Oct. 2 at the beginning of class**

Please collaborate on ideas, but write up individually. If still stuck, come to office hours or email me. Unless labeled A, B, etc, problems are from Alligood-Sauer-Yorke. Remember to show your working/reasoning. Answers that appear without explanation will not receive a high score! Some of your time this week is devoted to getting started with Matlab. For help, always start with our course website http://math.dartmouth.edu/m53f13/resources.html, then ask friends or myself.

T1.14 For part (b) only do for the interval RRL.

T1.16 In part (b) there is a typo. For $f^6(x)$ read as $G^6(x)$.

1.6 In part (c), you may use $1/4$ apart instead.

1.8 Easy but you must be creative.

Lab visit 1 Read pages 39-42, then adapt your Matlab code from HW1 to model the beetle populations, ie. to numerically evaluate Eqs. (1.6) for $N = 200$ iterations. [Hint: make $x$ a $3 \times (N + 1)$ array instead of a $1 \times (N + 1)$ vector. Use each row to represent one of the variables $L, P$, and $A$. Last part of intro53.m will be helpful.]

(a) Print out graphs of $L_t$ (larval population) vs $t$ (in time steps) for the two choices $\mu_a = 0.27$ and $\mu_a = 0.96$. If you got your equation correct this will show the same behavior observed in experiments on p. 41. (You may choose 100 for your starting populations.)

(b) For $\mu_a = 0.96$ make a 3D scatter (ie. no lines) plot of points $(L_t, P_t, A_t) \in \mathbb{R}^3$, and use it to answer: what kind (dimension/topology) of attractor in $\mathbb{R}^3$ does the aperiodic-looking orbit settle on to? [Hint: look up plot3, also axis vis3d will help. You may want to increase $N$ but discard the first hundred iterations.]

(c) Describe in one sentence how you could test whether this $\mu_a = 0.96$ behavior is chaotic. BONUS: Perform this test. Is it?

Comp. Exp. 2.1 Page 52. Use my code explormap2d.m to mess around with the Hénon map. Find the requested $a$ value to 2 decimal places where the orbit type changes. Use trial and error. Why is it hard?

2.1 Easy review of Math 22

2.3

T2.5