

Math 4428 Homework 6

due March 26, 2007

This is a study of the competing species dynamics described in Section 4.11. Consider the four possible situations in Figure 4.10.

- (i) Of the 4 possible models, explain the pros and cons of each model briefly. Which model is most realistic in its behavior? Why?
- (ii) The model described in Figure 4.10(c) describes a situation where the two species live happily without extinguishing the other. Using the method in Section 2.2, determine if this equilibrium is stable.
- (iii) Using the method in Section 2.2 to show that the equilibrium point $(0, a_2/c_2)$ in Figure 4.10(d) is stable.
- (iv) Use Matlab (see my `run_competing.m` and `competing.m` codes) to obtain the evolution of population for the situations depicted in Figure 4.10(d). Choose $a_1 = 3$, $a_2 = 2.5$, $b_1 = 2$, $b_2 = 1$. You choose c_1 and c_2 , and the initial population magnitudes to realize the situation in which one species or another disappears.