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.