MTH 370, Fall 2009
Homework 8

Instructions: Do these calculations by hand (you may use a computer or calculator for simple arithmetic and function evaluations) and show your work.

1. One unrealistic feature of the the Lotka-Volterra model is that it the prey population grows without bound in the absence of predators. We can remedy this fault by introducing a logistic-type term for the prey's reproduction rate:

$$\frac{dx}{dt} = (a(K - x) - by)x,$$
$$\frac{dy}{dt} = (dx - c)y,$$

where $K > 0$ is the carrying capacity for the prey population. Analyze this modified Lotka-Volterra model the same way we did the original Lotka-Volterra model in class. That is, find the equilibria and determine their stability type, find the x– and y–nullclines and determine in which direction solutions traverse them, and then plot all this information, including a few representative solutions, in the phase–plane.