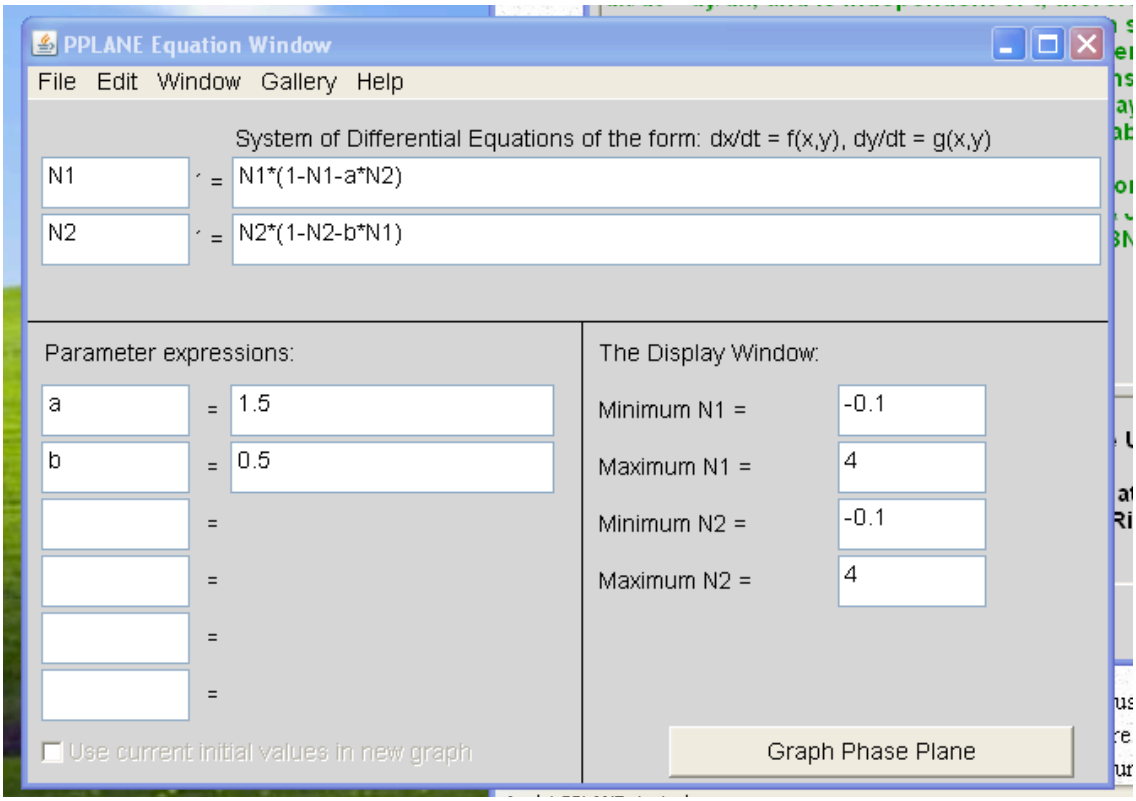
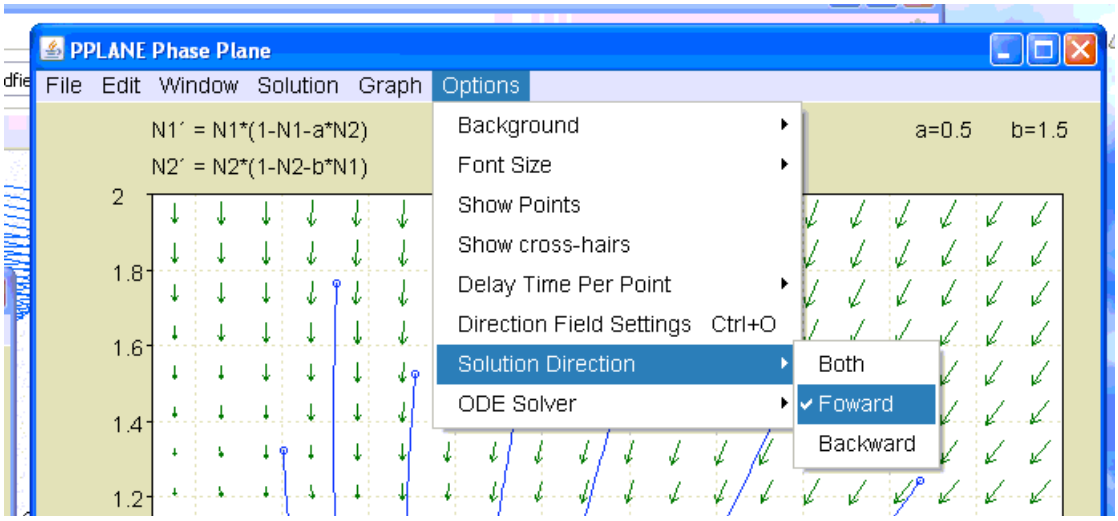
Using PPLANE to explore the Lotka-Volterra Competition model

1. Start up PPLANE (link on course website, under "Course Notes and Resources")
2. Click on OK to get rid of the copyright notice window
3. Enter equations in the PPLANE Equation Window. Also enter the ranges that we want on the axes of our figure. Click on "Graph phase plane"



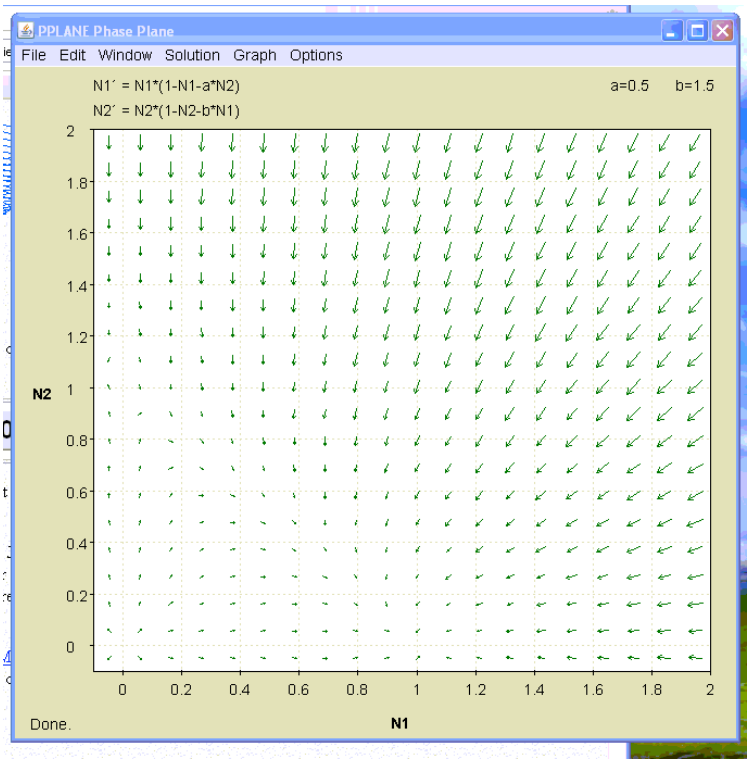
4. The phase plane/vector field will appear. Tell PPLANE to draw solutions in the forward direction: Options->Solution Direction->Foward (note typo in the menu!)



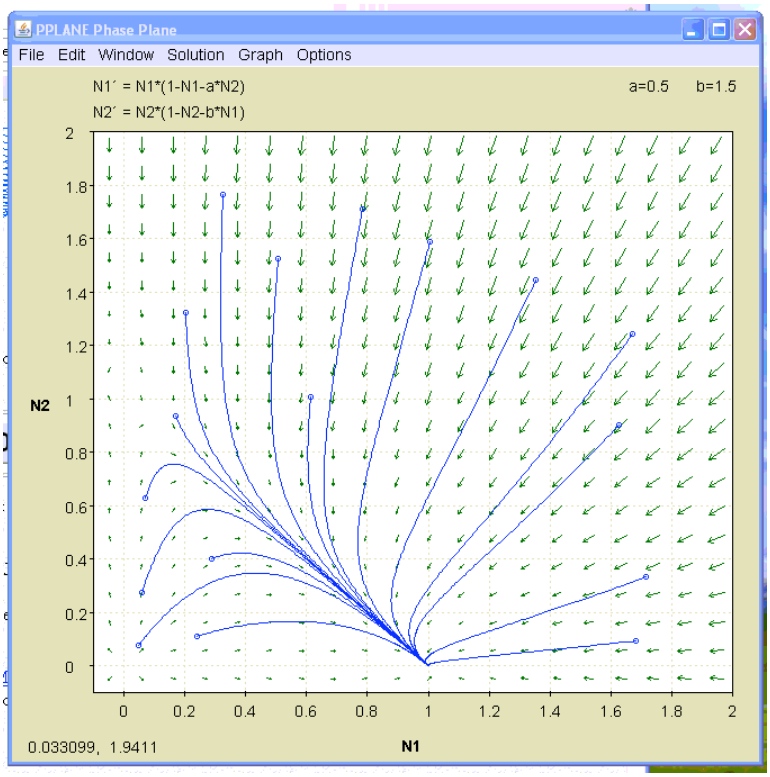
5. Click inside the graph to get PPLANE to draw the solution curve that starts at your choice of initial conditions.

   Choose a number of different initial conditions to get an idea of what happens. You should be able to figure out whether the various constant solutions are stable (attracting) or unstable (repelling).

   Notice how (i) the arrows are tangent to solution curves, (ii) the arrows give us a very good visual impression of the behavior of the model.



Vector field before clicking to get solution curves



Vector field with solution curves superimposed.

Circles denote locations where solution curves were started.

Notice that all solution curves approach the constant solution (equilibrium) at (1,0):

this constant solution has species 1 at its carrying capacity and species 2 has gone extinct. Species 1 has *outcompeted* species 2 and driven it to extinction: *competitive exclusion*