You may use your notes, the text, computers and calculators. **You may not discuss this test with anyone except me.**

You should use ODE Architect to solve this problem. Write or type your answers neatly, explaining your work. Include illustrative graphs. (Make sure that the background is white before you copy them. Also do not include every graph you make, just a few which you think are the best.) Turn in the exam at 1:15, Weds 4/21 at the beginning of class. Total number of points: 40.

The following differential equation is a model for the interaction of two species:

\[
dx/dt = 6x - x^2 - 4xy \\
dy/dt = 5y - 2y^2 - 2xy
\]

(a) Does this system describe two cooperative or two competitive species? Explain your answer. Also illustrate your answer by choosing some initial values and seeing what happens.

(b) Find all equilibria. (There are four of them; find them as exact fractions as well as finding their decimal value.)

(c) What happens if \(x = 0\)?

(c) What happens if \(y = 0\)?

(d) What happens if \(x = 4/3\) and \(y = 7/6\)?

(e) What happens if \(x\) is a number near 4/3 and \(y\) is near 7/6 (e.g. their decimal expansions)?

(f) What does part (e) say about world peace?

**SOME NOTES ON USING ODE ARCHITECT**

– If you want to change the initial conditions, first go to the “solutions” menu item and clear all runs. Then enter the new initial conditions. (This prevents the initial conditions from changing back to their original values.)

– The horizontal lines on the graphs are the graphs of equilibrium points. To remove these, go to the edit icon to the top right of the graph, go to the “equilibrium” item and make sure that “show” and “show labels” are not checked.