Math 363 Homework Due Monday, November 13

Let's analyze the built-in example in pplane:

$$\begin{aligned}\frac{dx}{dt} &= 2x - y + 3(x^2 - y^2) + 2xy\,,\\ \frac{dy}{dt} &= x - 3y - 3(x^2 - y^2) + 3xy\,.\end{aligned}$$

a. Find all equilibrium points of this system.

b. Calculate the Jacobian matrix J of the system.

c. Using a linearization analysis as we did in class, determine the nature and stability of the equilibrium point in the first quadrant. That is, evaluate the Jacobian matrix J at the equilibrium point, calculate its eigenvalues, and then refer to the two tables handed out in class.

d. Sketch a complete and properly labeled phase portrait of the system. Label the equilibrium points, and note their nature and stability. (You do not have to give the details of the linearization analysis for each equilibrium point as you did in part c for the equilibrium point in the first quadrant.)