Differential Equation: Homework #11

Due on November 23th, 2015 at 3:10pm

Professor Heather Lee Section 061

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Problem 1

7.3 - 17

$$\begin{bmatrix} 3 & -2 \\ 4 & -1 \end{bmatrix}$$

$$(3-\gamma)(-1-\gamma)-(-2)4=0$$

$$(\gamma-1)^2=-4$$

$$\gamma_1=1+2i$$

$$\gamma_2=1-2i$$

Plug it in to the original matrix, for 1+2i we get

$$(2-2i)v_1-2v_2=04v_1+(-2-2i)v_2=0$$

Solve it

$$v_1=\begin{bmatrix} 1 \\ 1-i \end{bmatrix}$$

Same for v_2

$$v_2=\begin{bmatrix} 1 \\ 1+i \end{bmatrix}$$

Problem 2

7.3 -20

$$(1-\gamma)(-1-\gamma)-3=0$$

$$\gamma=\pm 2$$

when $\gamma=2$

$$v_1=\begin{bmatrix} \sqrt{3} \\ 1 \end{bmatrix}$$

Problem 2 continued on next page. . .

when $\gamma = -2$

$$v_2 = \begin{bmatrix} 1 \\ \\ -\sqrt{3} \end{bmatrix}$$

Problem 3

7.5-1

$$\begin{bmatrix} 3 & -2 \\ \\ 2 & -2 \end{bmatrix}$$

We found that the eigenvalue for the matrix is

$$\gamma = -1 \quad \gamma = 2$$

and the corresponding eigenvectors are

$$v_1 = \begin{bmatrix} 1 \\ \\ 2 \end{bmatrix}$$

and

$$v_2 = \begin{bmatrix} 2 \\ \\ 1 \end{bmatrix}$$

So the solution is

$$x(t) = c_1 \begin{bmatrix} 1 \\ \\ 2 \end{bmatrix} e^{-t} + c_2 \begin{bmatrix} 2 \\ \\ 1 \end{bmatrix} e^{2t}$$

Problem 4

7.5-4

$$\begin{bmatrix} -1 & 1 \\ \\ 4 & -4 \end{bmatrix}$$

Problem 4 continued on next page...

We found that the eigenvalue for the matrix is

$$\gamma = 2 \quad \gamma = -3$$

and the corresponding eigenvectors are

$$v_1 = \begin{bmatrix} 1 \\ \\ 1 \end{bmatrix}$$

and

$$v_2 = \begin{bmatrix} 1 \\ \\ -4 \end{bmatrix}$$

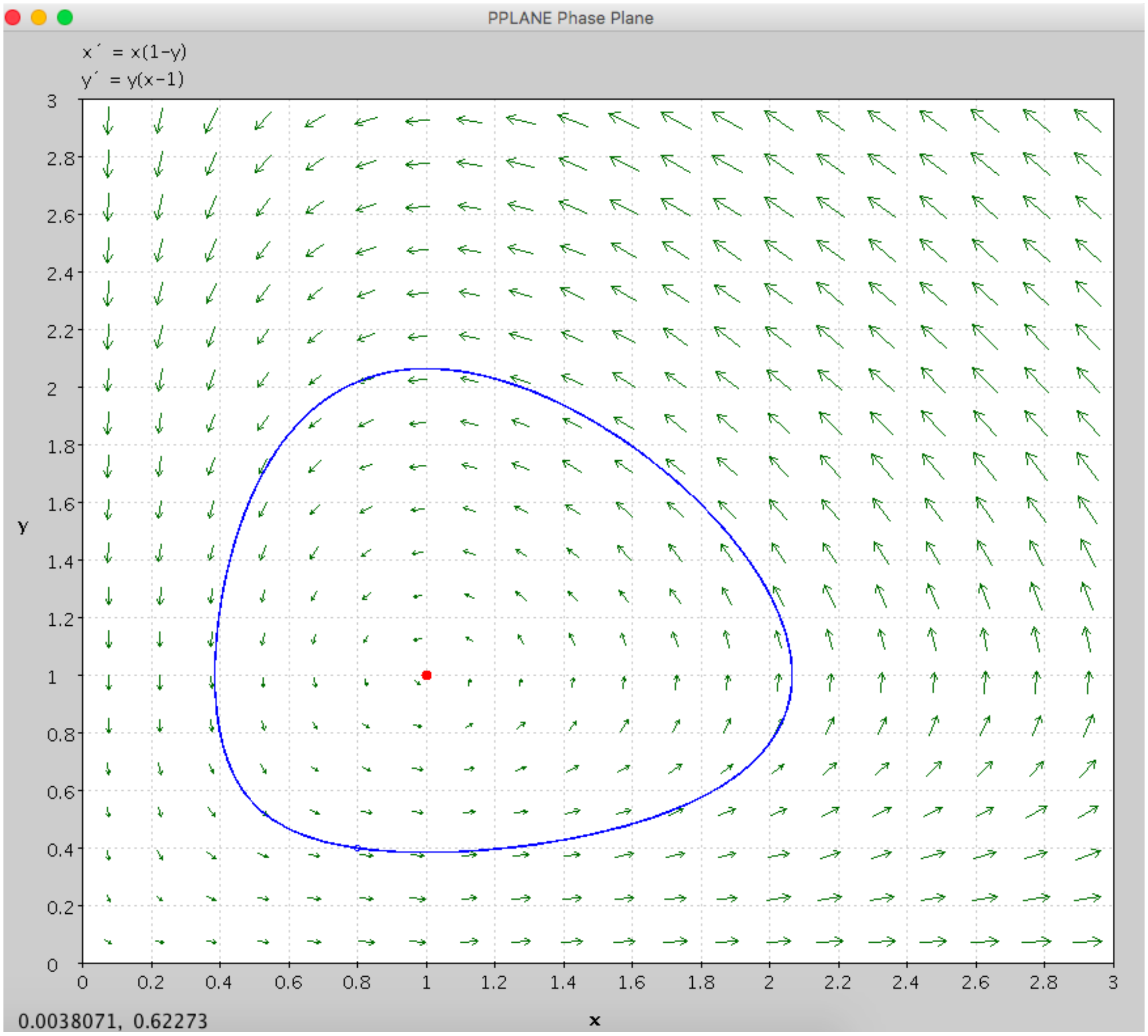
So the solution is

$$x(t) = c_1 \begin{bmatrix} 1 \\ \\ 1 \end{bmatrix} e^{2t} + c_2 \begin{bmatrix} 1 \\ \\ -4 \end{bmatrix} e^{-3t}$$

Problem 5

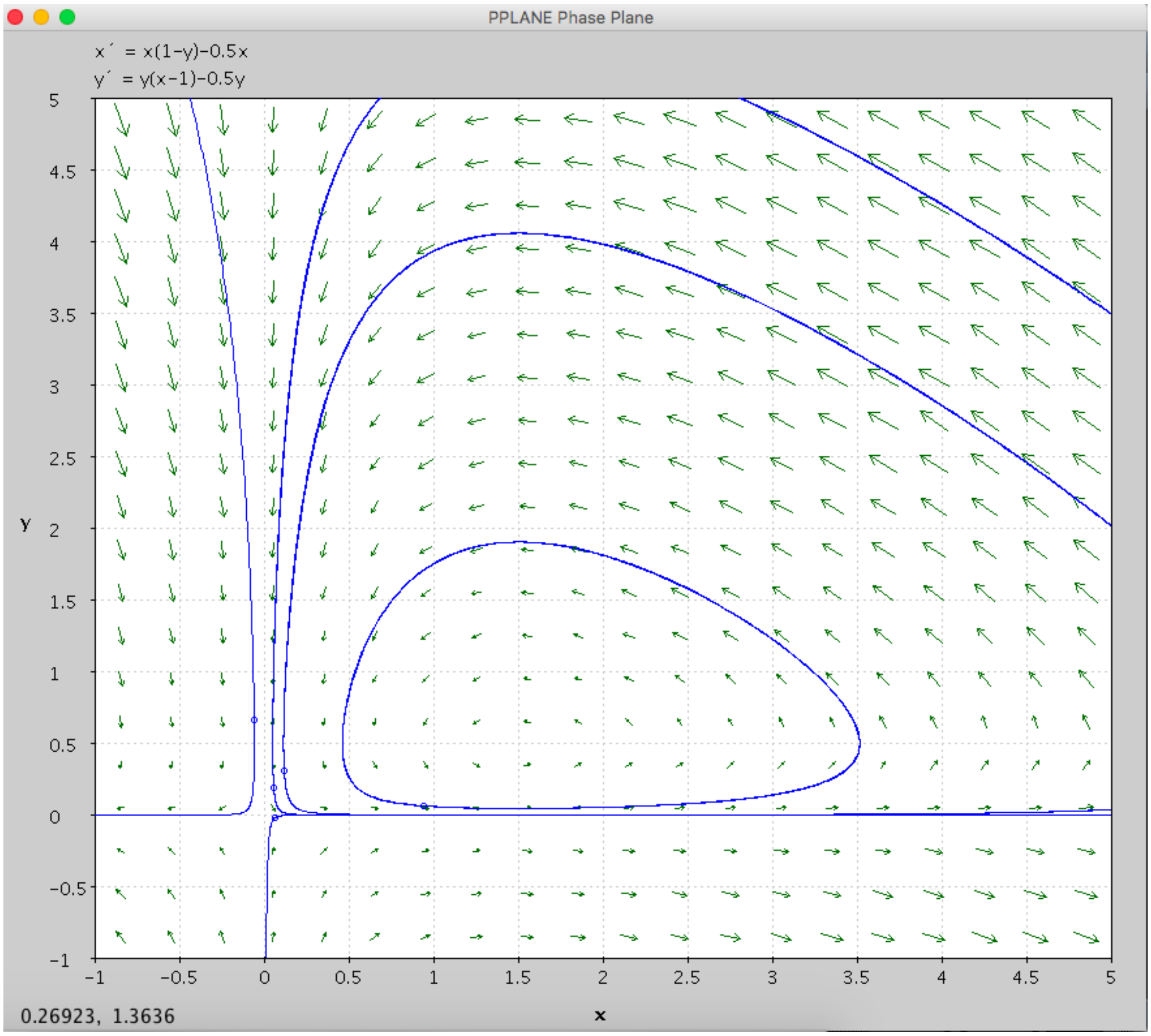
Project 3

1

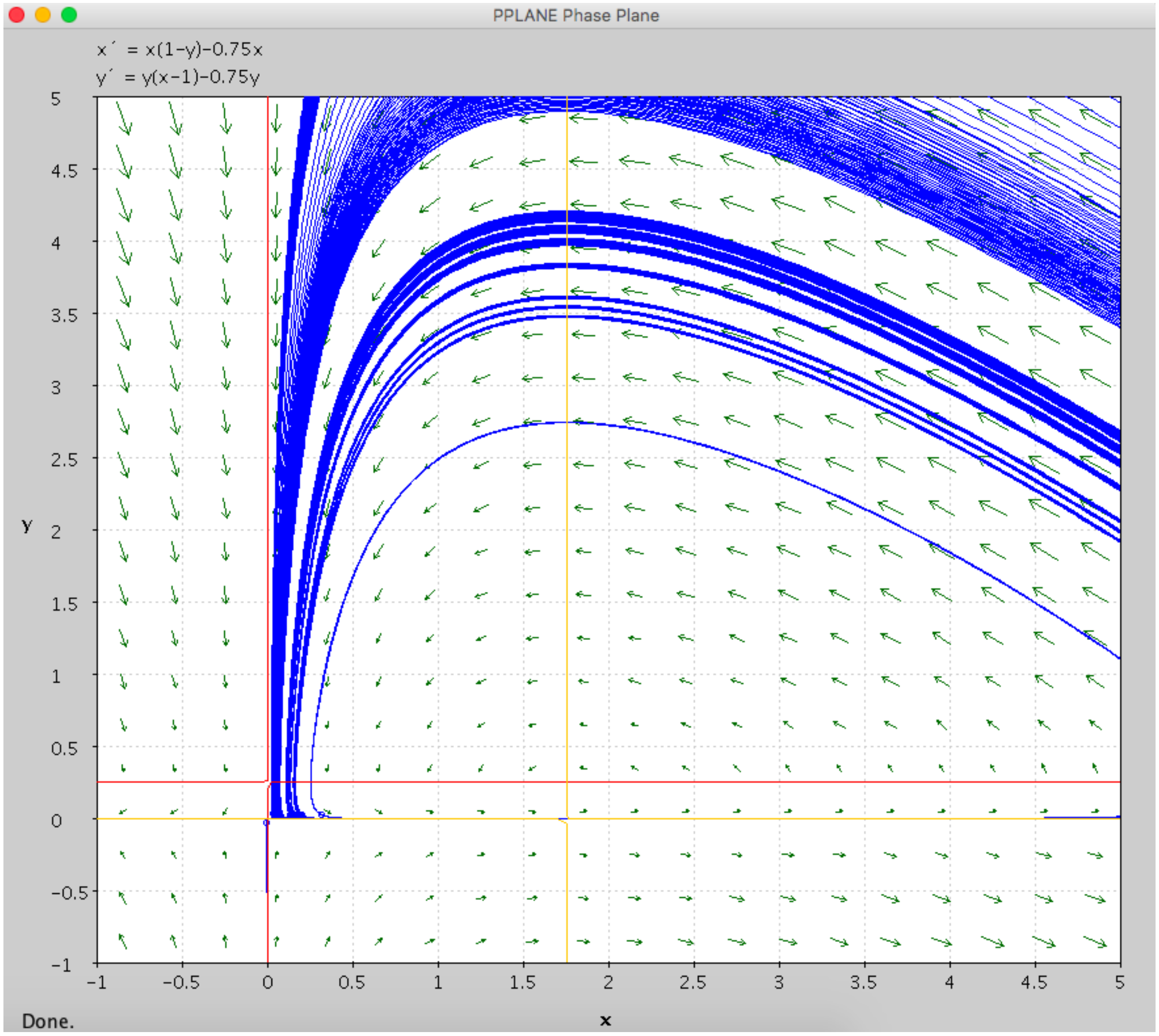


From the graph we could see the x is never less than 0.3million(300,000) so it's not eradicated as well. And the ladybug (y axis) is greater than 2 so it will exceed 2million

2

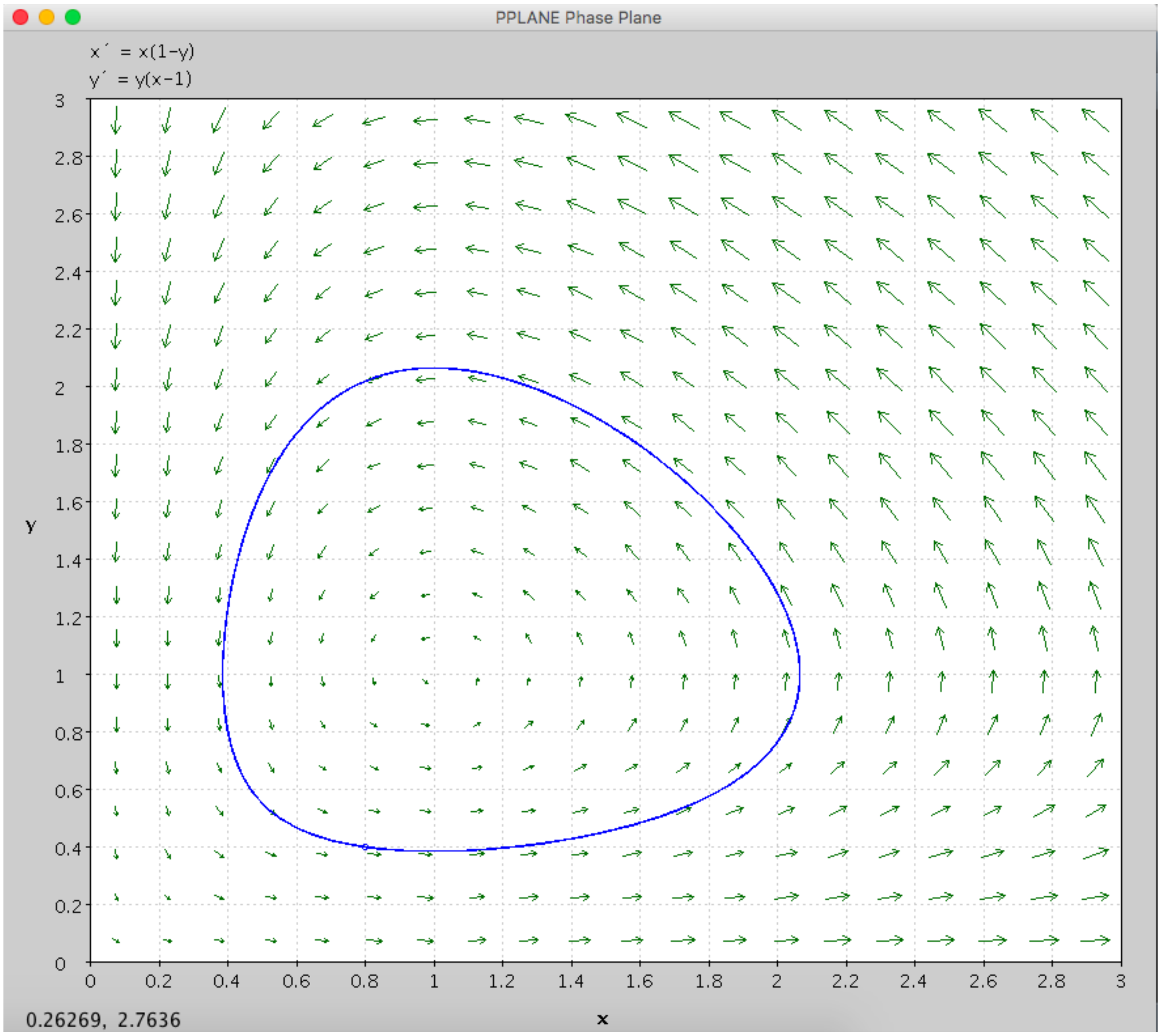


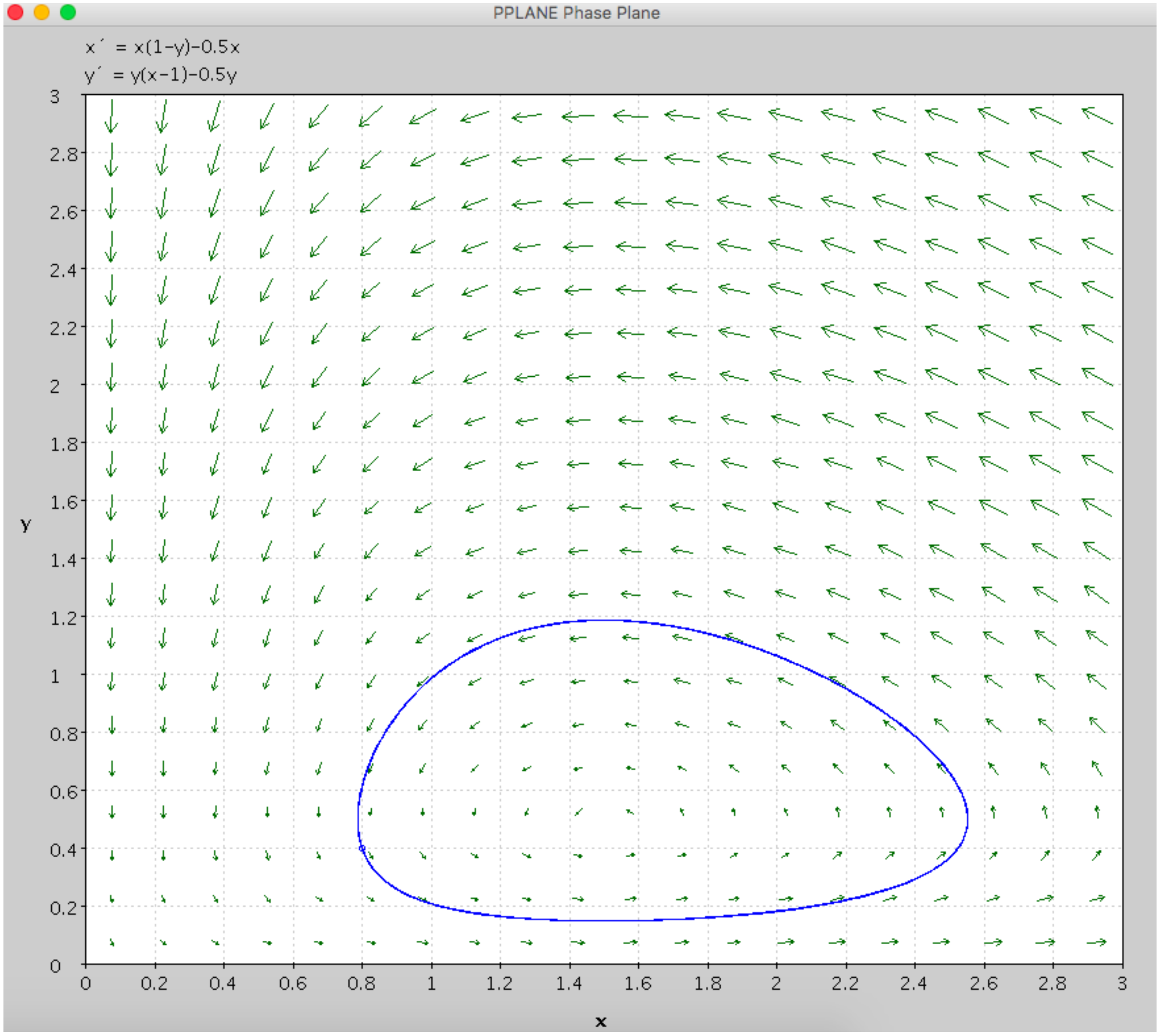
From the graph we could see that the x is never becoming 0 so it won't be eradicated for s =0.5



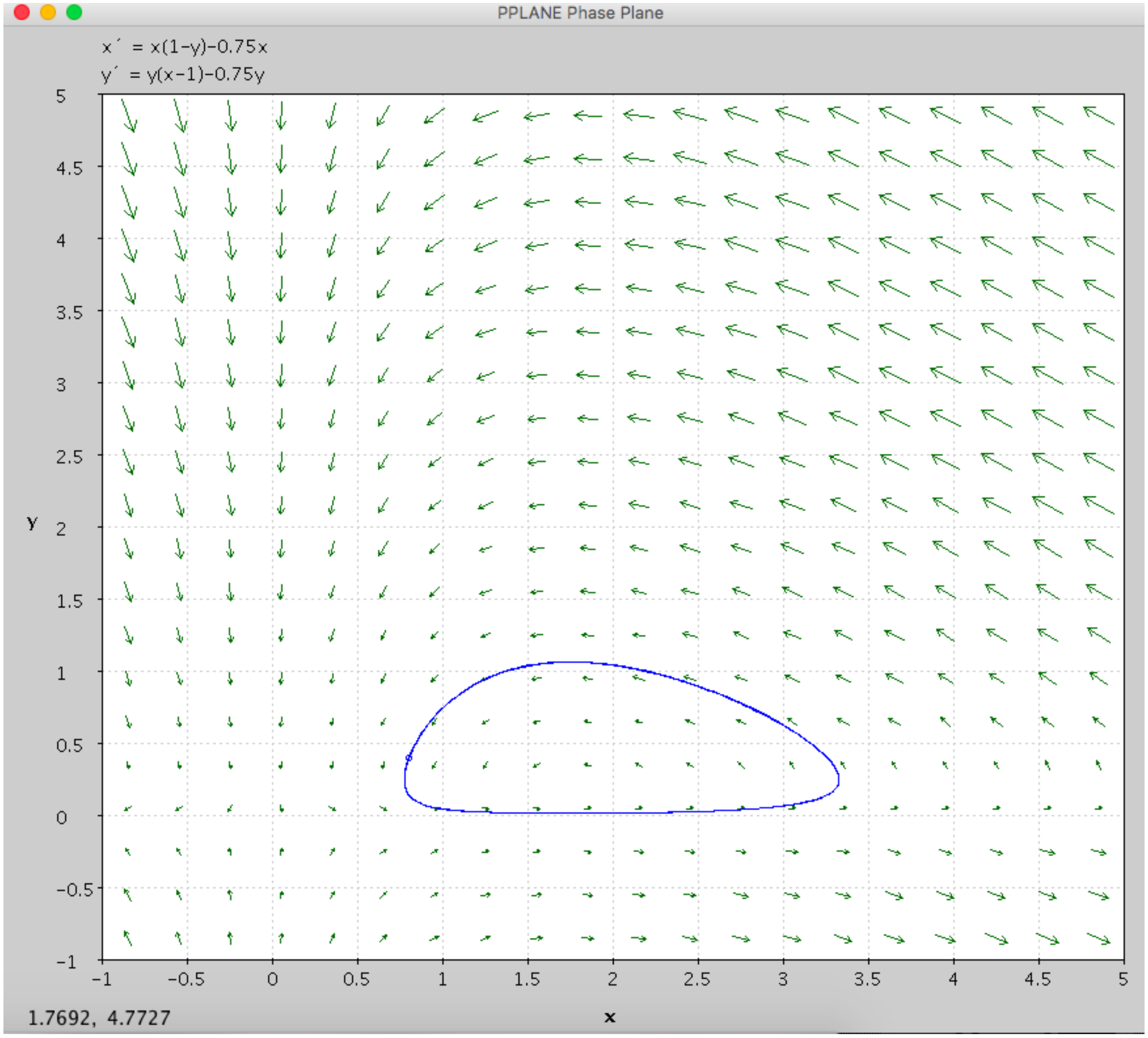
From the graph we could see that the x is never becoming 0 so it won't be eradicated. as well for s=0.75

3



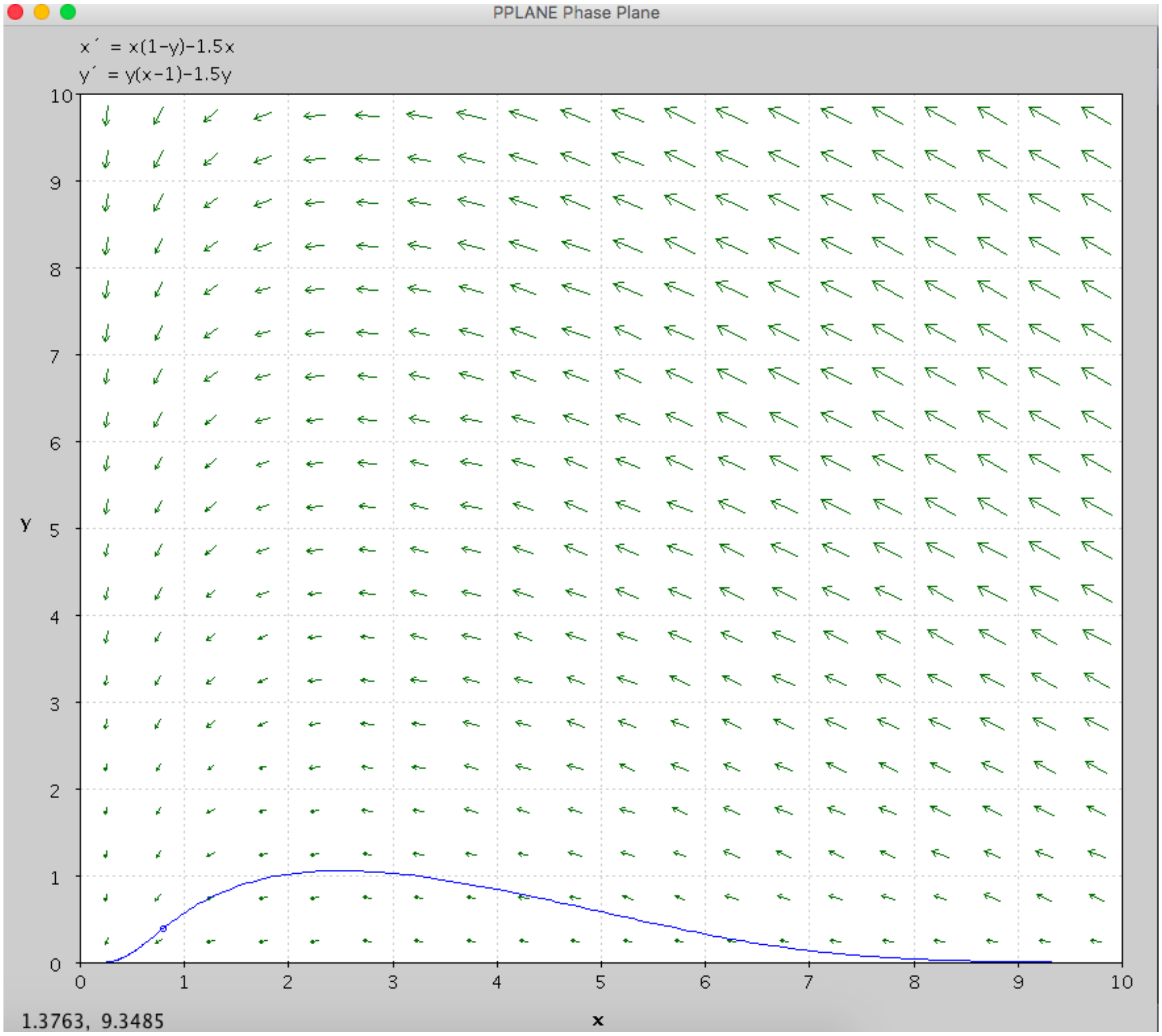


Problem 5 continued on next page…



From the plot above we could see it would work for s=0 and s=0.5

4



As you can see on the graph, both bugs will be eradicated