ASSIGNMENT 1

PART 1: the logistic map. Simulate the logistic map $F(x) = a * x(1-x)$ for (i) $a = 2$, $x_0 = 0.2$, and $a = 3.2$, $x_0 = 0.4$. (See plots below).

PART 2: the 2d standard map. $F(x,y) = (x+a\sin(x+y), x+y)$

SIMULATION FOR FIXED a=-0.7

1. (i) Simulate the standard map dynamics taking 500 iterates
   for each initial condition. Try with different initial conditions.
   (ii) Modify the code such that the program takes NP initial
        conditions on the x axis i.e. (x,0) with x between xmin and xmax.
   Plot in x,y variables. Try with NP=100.
2. Find exact initial condition of a 2-periodic point.
3. Find good approximate initial condition of a 3-periodic point, ie find
   a fixed point of F^3.
   Plot the associated orbit. Plot an invariant curve around it.
4. Find approximate initial condition of a 4-periodic point, ie find
   a fixed point of F^4. Plot the associated orbit. Plot an invariant
   curve around it.
5. Plot a vertical invariant curve. Plot another one around the origin.
6. Make some comments on the dynamics you see on the plot.

FILM SIMULATION FOR VARYING a

take a=-0.1,-0.3, -0.5,.....,-2.1
(10 different values of a), and for each a, obtain the
output data. Plot, as a film, the evolution of the dynamics
varying a, that is, plot 10 different plots.

7. 7.1 What do you observe for a=-0.1? And for a=-2.1? Explain.
   7.2 Explain the evolution on the dynamics when varying a.

Send ONE pdf file: yourname-ass1.pdf containing: the answers, the plots and the code (Fortran, C, matlab,....) to merce.olle@upc.edu

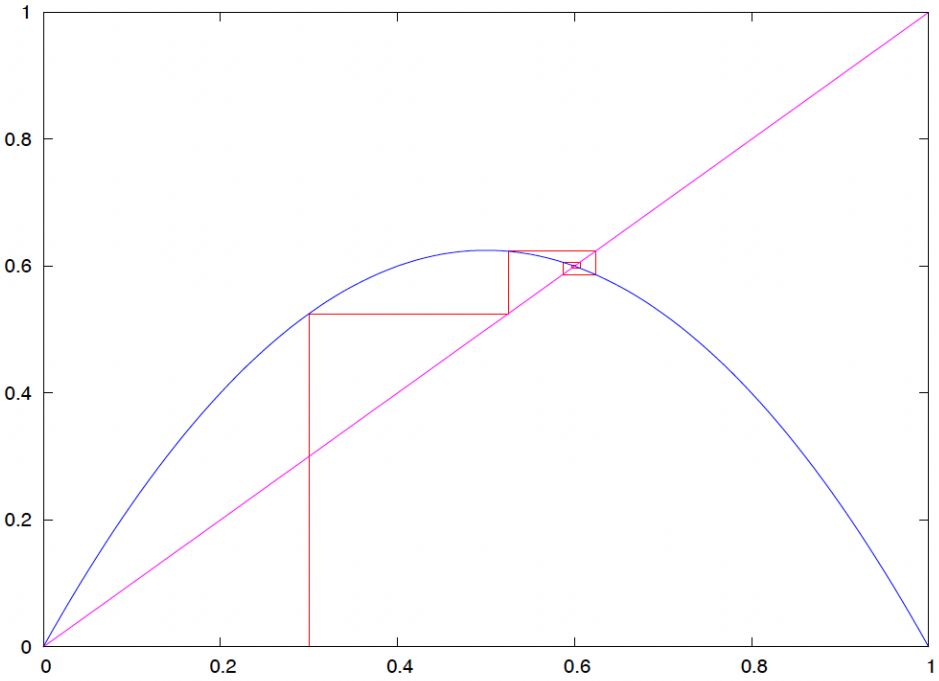

Figure 2: $a = 2$, $P_0 = .3$.

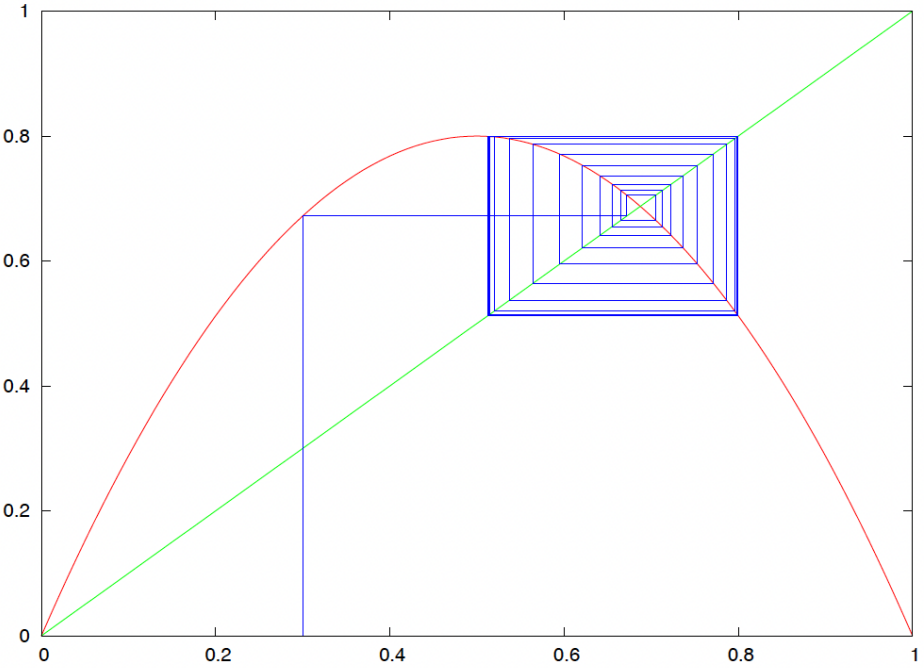

Figure 3: $a = 3.2$, $P_0 = .3$.

FIGURE 1.

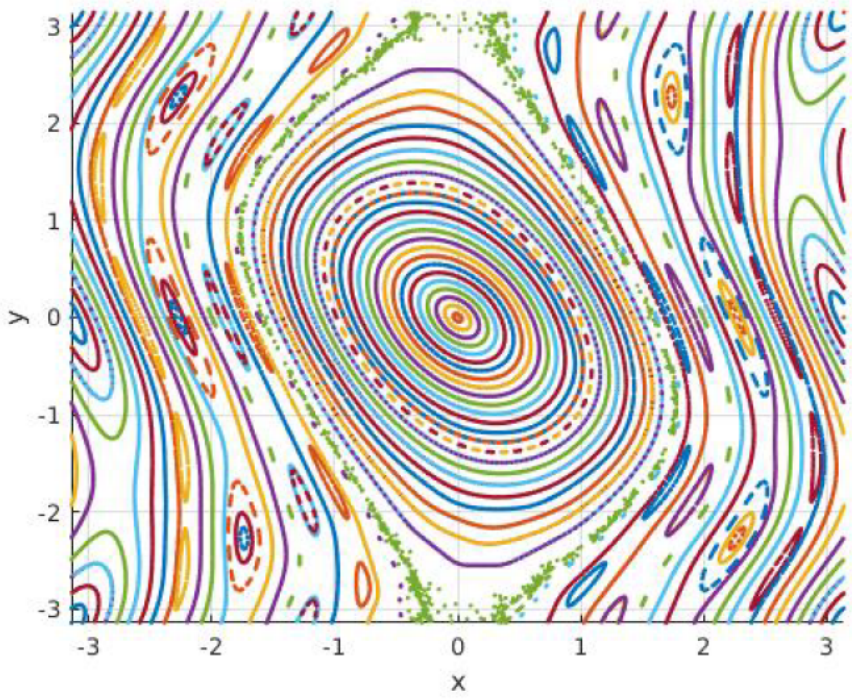

FIGURE 2. The 2d standard map, for $a = -0.7$.