Chaotic Dynamics - CSCI 5446

Problem Set 2

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Problem 1

The Figure 1 represents the m iterates of the logistic equation on the axes x_n Vs R. Value of $m = 600$, $l = 300$, $2.8 < R < 4$, and the interval between R value is 0.01

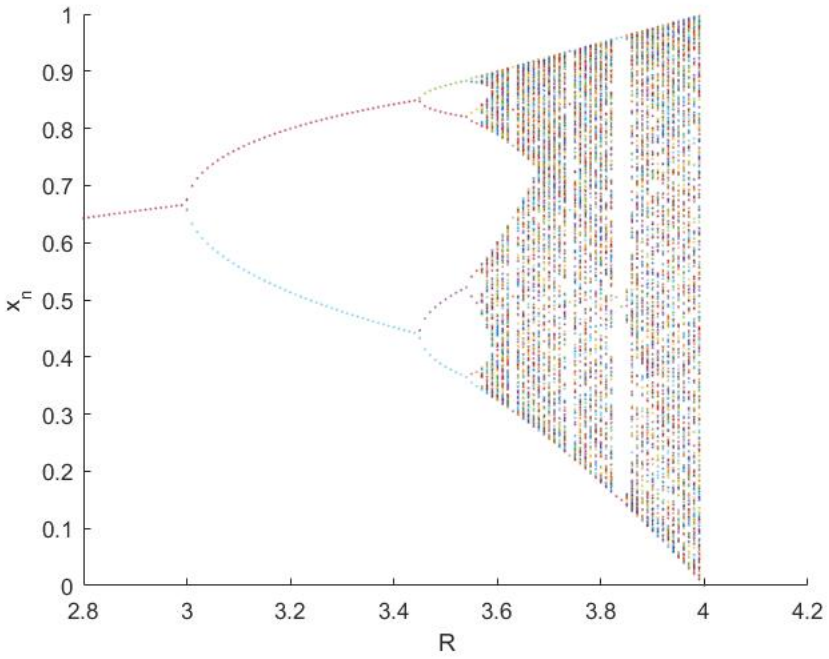

Figure 1: Bifurcation Plot

Problem 2

The Below Figure shows the places where bifurcation takes place for period 2,4,8,16.

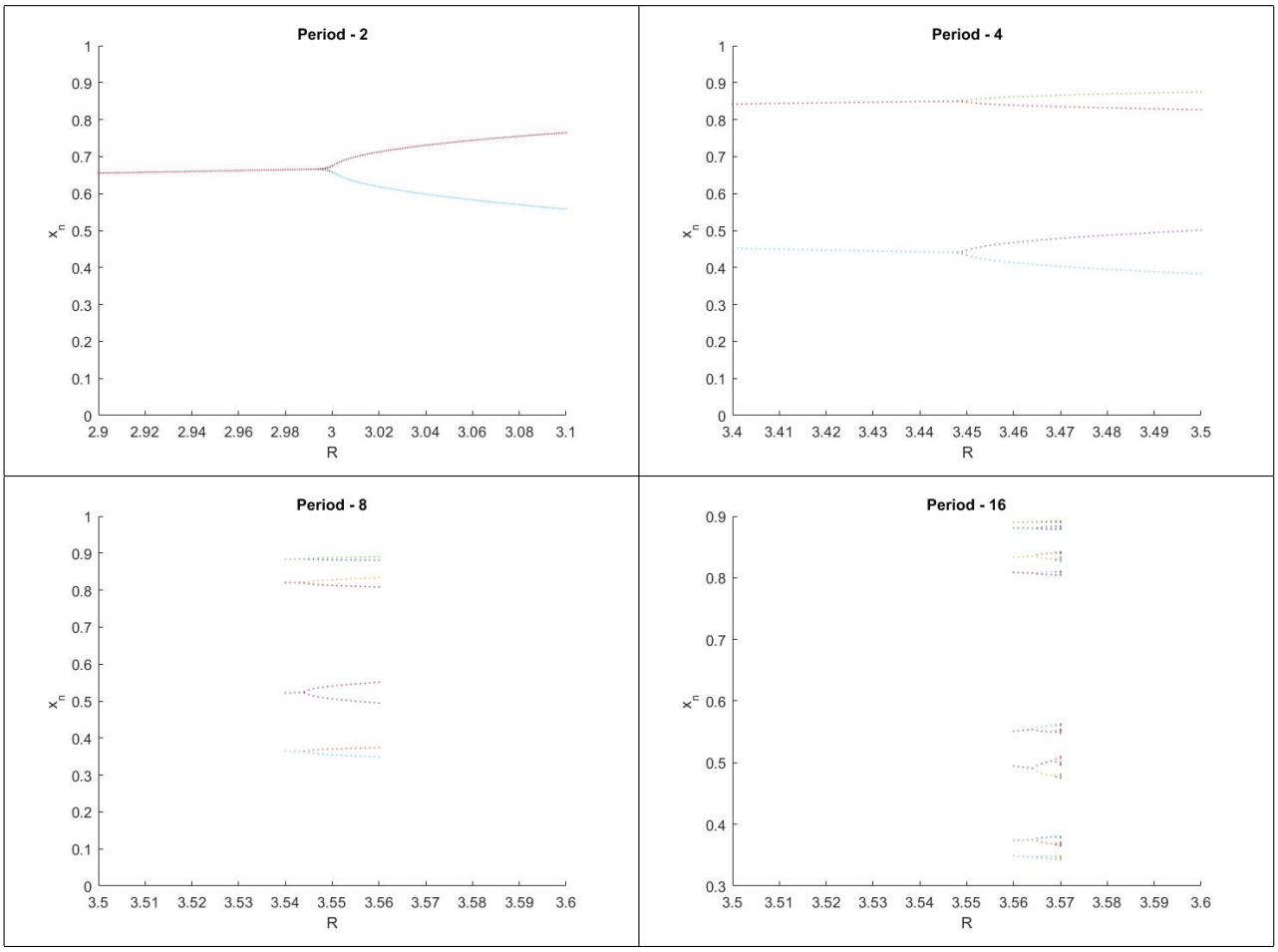

Table 1: Value of R where bifurcation takes place

n	R	Period
1	3	2
2	3.449	4
3	3.544	8
4	3.564	16

$$Feigenbaum\,number = \frac{r_n - r_{n-1}}{r_{n+1} - r_n}$$

The Feigenbaum value obtained by substituting $n = 2\,\&\,3$ is $4.726\,\&\,4.657$ respectively.

Problem 3

The Figure 2 and 3 represents the bifurcation plot of Henon Map with value of $m = 600$, $l = 300$, $0 < a < 1.4$, $b = 0.3$, and the interval between a value is 0.01

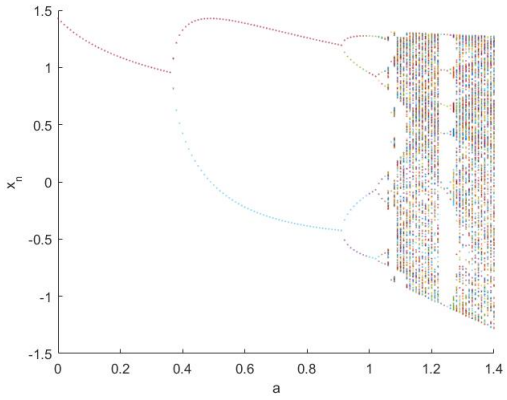

Figure 2: Bifurcation Plot

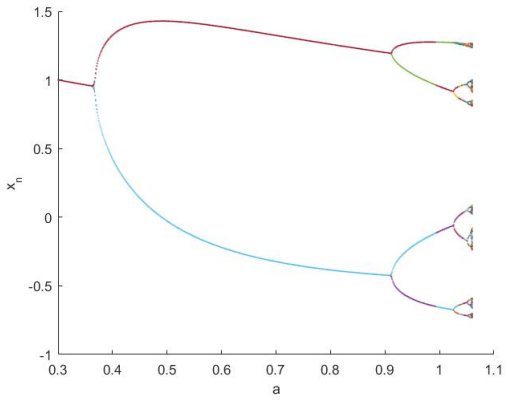

Figure 3: Bifurcation Plot

Table 2: Value of a where bifurcation takes place

n	a	Period
1	0.364	2
2	0.912	4
3	1.026	8
4	1.051	16

$$Feigenbaum\,number = \frac{a_n - a_{n-1}}{a_{n+1} - a_n}$$

The Feigenbaum value obtained by substituting $n = 2\,\&\,3$ is $4.807\,\&\,4.715$ respectively.

Problem 4

- Yes, the answers of Problem 2 & 3 are close and will be same as $n \to \infty$
- Yes, they should be the same as both the maps belongs to one parameter family of unimodal maps.