1- Answer by TRUE or FALSE the following:

1.	If f is an expanding map, then it implies that it is chaotic.	
	True	False
2.	If f is expanding then it is expansive.	
	True	False
3.	If f is expanding and the derivative is continuous then it is expansive.	
	True	False
4.	Let f be a continuous function. If the periodic points are dense then the function is expansive.	
	True	False
5.	If f is continuous and has a periodic point of period three then is not one to one	
	True	False
6.	If f has a periodic point of period three then is not one to one.	
	True	False
7.	Let $f: I \to I$ be an injective (one to one) continuous increasing function then it has a fixed point.	
	True	False

2- Prove the following:

- 1. If f has an attracting periodic point then the periodic points are not dense.
- 2. If f has an attracting periodic point then f is not expansive.
- 3. Then map f(x) = 4x(1-x) is not expansive.
- 4. Let $f : \mathbb{R} \to \mathbb{R}$ be an injective (one to one) continuous function then it is not chaotic. Does it have fixed points? If it is decreasing?
- 5. Let f be a derivable function. If p is a fixed point of f such that it attracts from one side and repells from the other side. Then p is neutral fixed point (|f'(p)| = 1).
- **3-** Let F(x) = 4x(1-x).
 - 1. Sketch the graph and find the fixed points. Are attracting or repelling? Justify.
 - 2. Does it have periodic point of arbitrarily large period? Justify.
 - 3. Is F restricted to the interval [0, 1] expansive? Justify.

- 4. Find the set $\{x: F^n(x) \to +\infty\}$.
- 5. Find the set $\{x: F^n(x) \to -\infty\}$.
- **3-** Let F(x) = 10x(1-x).
 - 1. Sketch the graph and find the fixed points. Are attracting or repelling? Justify.
 - 2. Does it have periodic point of arbitrarily large period? Justify.
 - 3. Find the set $\{x: F^n(x) \to +\infty\}$.
 - 4. Find the set $\{x: F^n(x) \to -\infty\}$.

4- Let $L: [0,3] \rightarrow [0,3]$ be the function.

$$L(x) = \begin{cases} 2x + x^3 & 0 \le x \le 1\\ \frac{3}{2}x - \frac{3}{2} & 1 < x \le 3 \end{cases}$$

- 1. Try to sketch the graph and find the fixed points. Are attracting or repelling? Justify.
- 2. How does the graph of L^n look for any positive integer n?
- 3. How many periodic points of period n does L have?
- 4. How many periodic points of period 30 does L have? Justify.
- 5. Are the periodic point dense? Justify.
- 6. Is it chaotic? Justify.
- 7. Explain how it is constructed a symbolic dynamic induced by L. Show that L is conjugate to the symbolic dynamics.