Introduction to Dynamical Systems and Chaos (Winter 2014)

Instructions 1

You may use any course materials, videos, websites, calculators, etc. for this test. Just don't ask another person for the answers or answers with other people. Please do not post questions about the test on the forum. If you have questions, please send them via er chaos@complexityexplorer.org. Thanks.

Question 2

Consider the function $f(x) = x^2 - 2$. What are the first three iterates of the seed $x_0 = 2$?
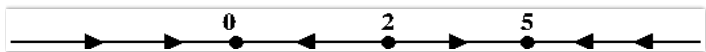
- 2, 2, 2, 2
- 2, 4, 8, 16
- 2, 0, -2, -4
- 2, 0, 2, 0

Question 3

The dynamics of a function is described by the phase line shown above. There are three fixed points. Which statement below correct the fixed points' stability?

- All the fixed points are stable
- 0 and 5 are stable, and 2 is unstable
- 0 and 5 are unstable, and 2 is stable
- 5 is unstable and 0 and 2 are stable

Question 4

For an iterated function described by the above phase line, what is the long-term behavior of the seed 3?

- it approaches infinity
- it is approaches 2
- it approaches 5
- there is not enough information to answer the question

Question 5

Which of the following numbers is a fixed point of the function $h(x) = 3x - 10$?

- -5
- 0
- 3.33
- 5

Question 6

The function $f(x) = (1/4)x + 12$ has a fixed point at x=16. Is this fixed point stable or unstable?

○ The fixed point is stable
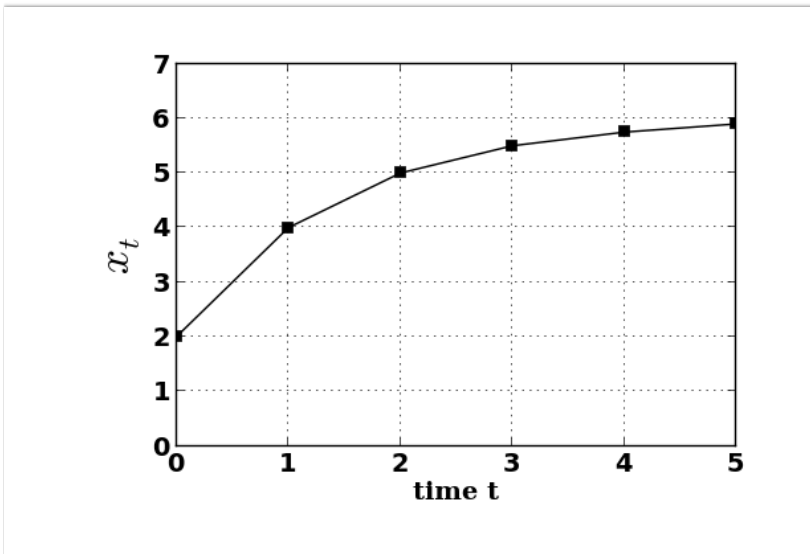
○ The fixed point is unstable

Question 7

A stable fixed point is also known as

○ a repellor

○ an attractor

○ a seed

○ a trajectory

Question 8

True or false: From a phase line one can determine exact numerical values for the orbit of any seed.

○ True

○ False

Question 9

The itinerary of an iterated function is shown in the above time series plot. The first four numbers in this itinerary are:

○ 1, 2, 3, 4

○ 2, 4, 5, 6

○ 2, 4, 5, 5.5

○ 2, 3, 4, 5

Question 10

Suppose 13 is a stable fixed point for a deterministic function $f(x)$. What is the value of the 43rd iterate of 13?

○ 0

○ 13

○ 43

○ There is not enough information to determine the iterate

Question 11

Consider $f(x) = 0.5x + 4$. What are the first three iterates of the seed 4?

○ 4, 6, 8, 8

○ 4, 6, 7, 7.5

○ 4, 4, 4, 4

○ 4, 6, 7, 8