Introduction to Dynamical Systems and Chaos (2021)

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 s 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 $x_0 = 2$?

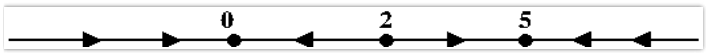
- 2, 2, 2, 2
- 2, 4, 8, 16
- 2, 0, -2, -4
- 2, 0, 2, 0

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

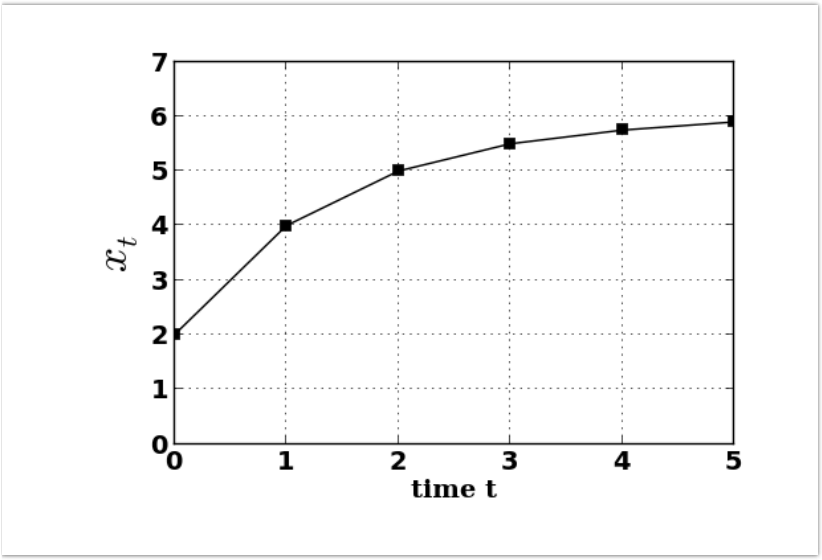
- a repellor
- an attractor
- a seed
- a trajectory

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 the seed 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