Nonlinear Dynamics: Mathematical and Computational Approaches (Fall 2014)

1.7 Maps I: Unit test » Take unit 1 test

Instructions 1

You may use any course materials, websites, books, computer programs, calculators, etc. for this test. Just don't ask another persor answers or share your answers with other people. Be aware that simply typing the question text into google is unlikely to get you dir right answer; you're going to have to read what you find there in order to extract that answer, and the course videos are probably a fa do that.

"Experts" notes clarify situations that haven't been covered in this course, but that may introduce subtleties into the exam answers. about them unless you understand the terms and issues in those notes.

If you have questions about the tests, please email us at nonlinear@complexityexplorer.org rather than posting on the forum.

Question 2

Maps describe continuous-time dynamics.

- True
- False

Question 3

Difference equations are used to model discrete-time dynamics.

- True
- False

Question 4

How many state variables does this map have?

$x_{n+1} = \cos x_n$

- 1
- 2
- 3
- Not enough information to answer
- Not defined

Question 5

How many state variables does this map have?

$x_{n+1} = ay_n$

$y_{n+1} = y_n \cos x_n$

- 1
- 2
- 3
- Not enough information to answer
- Not defined

Question 6

Dynamical systems must have lots and lots of state variables to be chaotic.

- True
- False

Question 7

Consider the following map: $x_{n+1} = rx_n + 3$

If $r = 3$ and $x_0 = 0.2$, what is x_2?

- 3.6
- 13.8
- 44.4
- None of the above

Question 8

A fixed point is always stable.

- True
- False

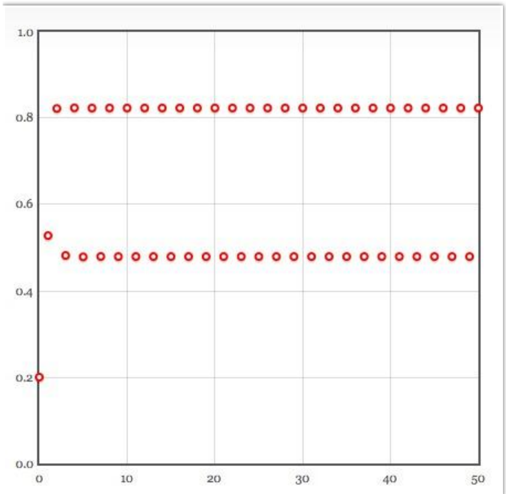
Question 9

A fixed point of a map f is a a state x^* such that

$x^* = f(x^*)$

- True
- False

Question 10



Consider the above plot, which shows 50 iterates of the orbit of the logistic map from $x_0 = 0.2.$

To what kind of attractor is this orbit converging?

- Fixed point
- Periodic orbit
- Chaotic
- None

Question 11

Consider the plot in the previous question. How long is the transient, roughly?

- One iterate.
- Two or three iterates.
- There is no transient.
- The orbit hasn't converged, so everything that you see in the plot is technically a transient

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Question 12

If two initial conditions of a given dynamical system—with the same parameter value(s)—converged to two different fixed points, both fixed points will always be unstable.

- True
- False

Question 13

If two initial conditions of a given dynamical system—with the same parameter value(s)—converged to two different fixed points, the lengths will always be different.

- True
- False

Question 14

If two initial conditions of a given dynamical system—with the same parameter value(s)—converged to two different fixed points, thos conditions must be in different basins of attraction.

- True
- False

Question 15

Use the logistic map app to generate trajectories from a variety of different initial conditions in the range 0.2<-x<-0.8 with r=3.5. Wh attractor (if any) does the system have?

- Fixed point
- Two cycle
- Four cycle
- Chaotic
- No attractor

Question 16

All nonlinear systems are chaotic.

- True
- False

Question 17

All chaotic systems are nonlinear.

- True
- False

Question 18

There are two variables in the logistic-map equation: x_n and r. Which of these is the *parameter*?

- x_n
- r

Question 19

Can a change in the logistic map's *parameter* cause a change in the topology of the attractor, *i.e.,* a bifurcation in the dynamics?

- Yes
- No