Introduction to Dynamical Systems and Chaos (Winter, 2015)

6.9 Test » Unit 6 Test

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 sh answers with other people. Please do not post questions about the test on the forum. If you have questions, please send them via ema chaos@complexityexplorer.org. Thanks.

I have embedded equations as image files instead of relying on the external equation renderer that has been giving us trouble the last f The equations don't look as nice, but they should be much more reliable.

Question 2

For the cubic equation there is a period-five window around r=6.064. There is a bifurcation from period five to period 10 at approximate value?

- 6.065
- 6.067
- 6.069
- 6.071
- 6.073

Question 3

A dynamical system undergoes a bifurcation from period one to period two at r=7. The system undergoes a bifurcation from period two four at r=9, and there is a bifurcation from period four to period eight at r=9.43. What is Δ_1 for this system?

- 1
- 2
- 3
- 7
- 9

Question 4

For the dynamcial system described in Question 2, what is Δ_2 ?

- 0.214
- 0.43
- 0.5
- 0.75
- 1.0

Question 5

For the dynamical system described in Question 2, what is δ_1 ?

- 4.11
- 4.30
- 4.65
- 4.669
- 4.72

Question 6

Suppose a dynamical system undergoes a bifurcation from period three to period six at r=10 and a bifurcation from period six to twelve approximately what r value would you expect to see a bifurcation from period twelve to period twenty-four?

- 16.000
- 16.071
- 16.142
- 17.000
- 19.669

Question 7

For the dynamical system described in Question 5, at approximately what r value would you expect to see a bifurcation from period twe period forty-eight?

- 16.300
- 16.600
- 17.071
- 18.214
- 20.669

Question 8

Suppose an electronic circuit undergoes a period-doubling transition to chaos. The first bifurcation, from period one to period two, is n occur when the voltage is 5V. A bifurcation from period two to period four occurs at a voltage of 8V. At approximately what value would to see the next bifurcation, from period four to period eight?

- 8.214
- 8.456
- 8.5
- 8.470
- 8.643

Question 9

Your answer to Question 7 is an approximation because

- A. There is experimental uncertainty in the exact value of the voltages.
- B. The ratio 4.669 only is exact for large periods
- C. Both A and B.

Question 10

A function with a single quadratic maximum that maps an interval to itself undergoes the period-doubling route to chaos. Which of the statements must be true about this dynamical system.

- A. The transition to chaos occurs at r=3.57
- B. The quantity $\frac{\Delta_1}{\Delta_2}$ is exactly equal to 4.669
- C. Its bifurcation diagram is identical to the logistic equation's bifurcation diagram.
- D. None of the above.