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 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

For the Hénon map with a=0.88 and b = 0.4, what do you observe is the long-term behavior of most orbits?

- The orbits approach a fixed point.
- The orbits approach a cycle of period two.
- The orbits approach a cycle of period four.
- The orbits are pulled in to a strange attractor.

Question 3

For the Hénon map with a=1.2 and b = 0.2, what do you observe is the long-term behavior of most orbits?

- The orbits approach a fixed point.
- The orbits approach a cycle of period two.
- The orbits approach a cycle of period four.
- The orbits are pulled in to a strange attractor.

Question 4

If an orbit is pulled to a strange attractor, which of the following statements is **not** true?

- The orbit is aperiodic
- The orbit will eventually reach a fixed point.
- The system has sensitive dependence on initial conditions.

Question 5

Why are stretching and folding key geometric ingredients for chaos?

- Folding ensures that the dynamical system is deterministic and stretching makes orbits aperiodic.
- Folding keeps orbits bounded and stretching leads to sensitive dependence on initial conditions.
- Folding makes systems unpredictable and stretching makes a strange attractor.

Question 6

Consider the Lorenz equations with the following parameter values: $\sigma = 20, \rho = 50, \beta = 2.667$. What is the best description of the lor behavior of the orbits? Answer this question using the program at: http://highfellow.github.io/lorenz-attractor/attractor.html

- The orbits are pulled toward a fixed point.
- The orbits are pulled to a periodic cycle
- The orbits are pulled to a strange attractor.

Question 7

Consider the Lorenz equations with the following parameter values: $\sigma = 20, \rho = 50, \beta = 2.667$. Does the dynamical system have sens dependence on initial conditions? Answer this question using the program at: http://highfellow.github.io/lorenz-attractor/attractor.h

- Yes
- No

Question 8

Consider the Lorenz equations with the following parameter values: $\sigma = 10, \rho = 25, \beta = 5$. What is the best description of the long- behavior of the orbits? Answer this question using the program at: http://highfellow.github.io/lorenz-attractor/attractor.html

- The orbits are pulled to a fixed point.
- The orbits are pulled to a periodic cycle.
- The orbits are pulled toward a strange attractor.

Question 9

Consider the Lorenz equations with the following parameter values: $\sigma = 10, \rho = 25, \beta = 5$. Does this dynamical system have sensiti dependence on initial conditions? Answer this question using the program at: http://highfellow.github.io/lorenz-attractor/attractor.h

- Yes
- No