Introduction to Dynamical Systems and Chaos (Winter, 2015)
2.9 Test » Test for Unit 2

Instructions 1

Note: If the equations in this test do not display properly, please download the pdf version of this test from this link. This file will sho equations correctly. Do not click on "Download Exam PDF". We apologize for the inconvenience.

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

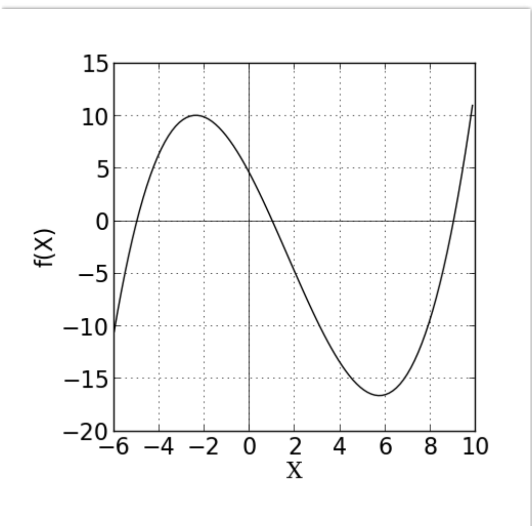
Consider the differential equation:

$$\frac{dT}{dt} = 0.2(20 - T)$$

Let the initial temperature be 5 degrees. (That is, T(0) = 5.) Using Euler's method with Delta t = 0.5, what does one obtain for T(0.5), temperature when the time t = 0.5?

- A. 6
- B. 6.5
- C. 9
- D. 11

Question 3



Consider the differential equation dX/dt = f(X), where f(X) is plotted above. Which of the following statements is true about this differe equation?

- A. It has an unstable fixed point at -5, a stable fixed point at 1, and an unstable fixed point at 9
- B. It has an unstable fixed point near -2.3 and a stable fixed point near 5.7
- C. It has a stable fixed point at -5, an unstable fixed point at 1, and a stable fixed point at 9
- D. It has stable fixed points at -5, 1, and 9
- E. It has unstable fixed points near -2.3 and 5.7

Question 4

Consider the differential equation dX/dt = f(X), where the graph of f(X) is shown in the statement of question 2, above. What is the lor behavior of a solution to this differential equation that starts at X=4? (I.e., X(0)=4.)

- A. It increases and approaches around 5.8
- B. It increases and approaches 9
- C. It oscillates between 4 and 7
- D. It decreases and approaches 1
- E. It decreases and tends toward negative infinity

Question 5

Consider the differential equation dX/dt = f(X), where the graph of f(X) is shown in the statement of question 2, above. What is the lor behavior of a solution to this differential equation that starts at X=0? (I.e., X(0)=0.)

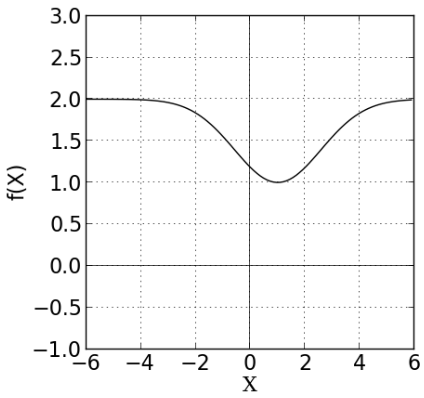
- A. X(t) increases and approaches 5.7
- B. X(t) does not change. 0 is a fixed point
- C. X(t) increases and tends toward infinity
- D. X(t) increases and approaches 1
- E. X(t) decreases and approaches -5

Question 6

Consider the differential equation dX/dt = f(X), where the graph of f(X) is shown in the statement of question 2, above. What is the lor behavior of a solution to this differential equation that starts at X=1? (I.e., X(0)=1)

- A. X(t) increases and approaches X = 5.7
- B. X(t) does not change. 1 is a fixed point.
- C. X(t) increases and approaches 9
- D. X(t) decreases and approaches -3
- E. X(t) decreases and approaches -5

Question 7



Consider the differential equation dX/dt = f(X), where f(X) is shown in the graph above. What is the long-term behavior of a solution t differential equation that starts at X=-2? (That is, X(0) = -2.)

- A. X(t) tends toward negative infinity
- B. X(t) increases and approaches 0
- C. X(t) increases and approaches 1
- D. X(t) tends toward positive infinity

Question 8

Consider the differential equation dX/dt = f(X), where f(X) is shown in the statement of question 6. Which of the following statements about this differential equation?

- A. It has a stable fixed point at X=1
- B. It has an unstable fixed point at X=1
- C. It has no fixed points

Question 9

True or False: From a phase line for a differential equation one can determine exact, numerical values for all solutions.

- A. True
- B. False