Unit 3 - Week 1

Course outline

How to access the portal?

Assignment Zero

Week 1

- Introduction, Stability, Phase Space & Invariant Sets - I
- Introduction, Stability, Phase Space & Invariant Sets - II
- Introduction, Stability, Phase Space & Invariant Sets - III
- Maps & Flows. Simple Examples of Dynamics Systems
- Quiz : Assignment 1
- Feedback

Week 2

Week 3

Week 4

Assignment 1

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2019-09-11, 23:59 IST.

In the following multiple choice questions (MCQs), choose (all) the correct answer(s). As usual the overdot signifies derivative with respect to time, $x = dx/dt$.

1) What are the critical points for *1 point*

$$\dot{x} = x^2 - 1$$

- 1
- +1,-1
- 0
- -1

No, the answer is incorrect.
Score: 0
Accepted Answers:
+1,-1

2) Classify the stability at the critical point(s) in the system *1 point*

$$\dot{x} = x^2 - 1.$$

- x = -1 is a stable fixed point
- The fixed point is a stable spiral
- The fixed points at +1,-1 are semi-stable
- x= 1 is an unstable fixed point

No, the answer is incorrect.
Score: 0
Accepted Answers:
x = -1 is a stable fixed point
x= 1 is an unstable fixed point

3) Consider the linear system, *1 point*

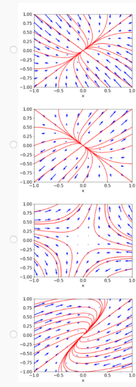
$$\dot{x} = 2x + y, \quad \dot{y} = x + 2y$$

From the eigenvalues of the Jacobian matrix, what can you say about the fixed point? It is a

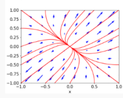
- Stable node
- Stable spiral
- Unstable node
- Unstable spiral

No, the answer is incorrect.
Score: 0
Accepted Answers:
Unstable node

4) The phase curves for the system Q. 3 above is *1 point*

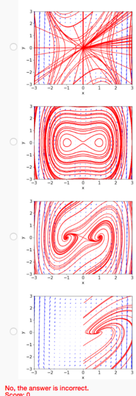


No, the answer is incorrect.
Score: 0
Accepted Answers:

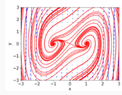


5) The phase portrait for the nonlinear system *1 point*

$$\dot{x} = y$$
$$\dot{y} = x(1 - x^2) + y$$



No, the answer is incorrect.
Score: 0
Accepted Answers:



6) If the Hamiltonian systems are conservative, therefore it has *1 point*

- Infinit Limit cycles
- No limit cycles
- Finite limit cycles
- 2 limit cycles

No, the answer is incorrect.
Score: 0
Accepted Answers:
No limit cycles

7) Which of the following options are true *1 point*

Let x^* be the fixed point of $x_{n+1} = f(x_n)$. Then,

- x^* is unstable when $|f'(x^*)| < 1$;
- x^* is stable when $|f'(x^*)| < 1$;
- x^* is unstable when $|f'(x^*)| > 1$;
- x^* is spiral at $|f'(x^*)| = 1$.

No, the answer is incorrect.
Score: 0
Accepted Answers:
x^* is stable when $|f'(x^*)| < 1$;
x^* is unstable when $|f'(x^*)| > 1$;

8) The stability in the linear approximation does not necessarily imply stability. *1 point*

- True
- False

No, the answer is incorrect.
Score: 0
Accepted Answers:
True

9) Determine the basin of attraction of the origin for the system *1 point*

$$\dot{x} = x(x^2 + y^2 - 4) - y$$
$$\dot{y} = x + y(x^2 + y^2 - 4)$$

using the Lyapunov function $V(x, y) = x^2 + y^2$.

- $X^2 + Y^2 < 4$.
- $X^2 + Y^2 = 4$.
- $X^2 + Y^2 > 4$.
- $X^2 + Y^2 = 0$.

No, the answer is incorrect.
Score: 0
Accepted Answers:
$X^2 + Y^2 < 4$.

10) The fixed points for the systems *1 point*

$\dot{x} = -x + x^3$, $\dot{y} = -2y$ are

- (0,0)
- (-1,0)
- (1,0)
- (1,-1)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(0,0)
(-1,0)
(1,0)