Unit 6 - Week 4

Assignment 4

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

Due on 2019-09-25, 23:59 IST.

1) *1 point*

The baker's map $\mathcal{B}$ of the square $0 \le x \le 1, 0 \le y \le 1$ to itself is given by

$$(x_{n+1}, y_{n+1}) = \begin{cases} (2x_n,\ ay_n) & \text{for } 0 \le x_n \le \frac{1}{2} \\ (2x_n - 1,\ ay_n + \frac{1}{2}) & \text{for } \frac{1}{2} \le x_n \le 1 \end{cases}$$

where a is a parameter in the range $0 < a \le 1/2$.

For what values of a is the baker map area-preserving?

- 1/4
- 1/3
- 1/2
- 2

No, the answer is incorrect.
Score: 0

Accepted Answers:
1/2

2) The box dimension of the attractor for the baker map with a= 1/2 is *1 point*

- 0
- 1/2
- 1
- 2

No, the answer is incorrect.
Score: 0

Accepted Answers:
2

3) *2 points*

Consider the dynamics of the baker's map in the case $a = \frac{1}{2}$. Given that $(x, y) = (.a_1a_2a_3..., .b_1b_2b_3...)$ is the binary representation of an arbitrary point in the square, write down the binary representation of $\mathcal{B}(x, y)$.

- $\mathcal{B}(x, y) = (.a_2a_3a_4..., .a_1b_1b_2b_3...)$
- $\mathcal{B}(x, y) = (.a_1a_2a_3a_4..., .b_2b_3b_4...)$
- $\mathcal{B}(x, y) = (.b_1a_2a_3a_4..., .a_1b_1b_2b_3...)$
- $\mathcal{B}(x, y) = (.a_2a_3a_4..., .b_2b_3b_4...)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\mathcal{B}(x, y) = (.a_2a_3a_4..., .a_1b_1b_2b_3...)$

4) *2 points*

With the above notation (see Q. 3), which of the following would give rise to a periodic orbit of $\mathcal{B}$ with prime period 2?

- $(x, y) = (.101010..., .101010...)$.
- $(x, y) = (.010101..., .010101...)$.
- $(x, y) = (.101010..., .010101...)$.
- $(x, y) = (.11111..., .00000...)$.

No, the answer is incorrect.
Score: 0

Accepted Answers:
$(x, y) = (.101010..., .010101...)$.

5) *2 points*

Which of the Hamiltonian functions below would have the evolution equations

$$\dot{q} = p, \dot{p} = q + q^2.$$

- $H(q,p) = p^2/2 + x$
- $H(q,p) = q^2 + p^3/3$
- $H(q,p) = p^2/2 - q^2/2 - q^3/3$
- $H(q,p) = q + p$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$H(q,p) = p^2/2 - q^2/2 - q^3/3$

6) If a two-freedom system is integrable, then which of the following statements is/are true? *2 points*

- In the 2-dimensional phase space there are 1-dimesional tori on the 2-dimensional energy shell
- In the 2-dimensional phase space there are 1-dimesional tori on the 2-dimensional energy shell
- In the 4-dimensional phase space there are 2-dimesional tori on the 3-dimensional energy shell
- In the 4-dimensional phase space there are 3-dimesional tori on the 4-dimensional energy shell

No, the answer is incorrect.
Score: 0

Accepted Answers:
In the 4-dimensional phase space there are 2-dimesional tori on the 3-dimensional energy shell