

ABSTRACT. This page should give you an idea, how weekly multiple choice quizzes look like. The quizzes do not any special preparation if you follow the lectures. Several choices in the multiple choice part are possible. The questions below address two lectures. The lecture today as well as the lecture on Friday. Next Monday, we already have a quizz of this format.

- 1) How many midterms do we have in Math 118r?
 - a) None, we have quizzes.
 - b) One midterm
 - c) Two midterms

- 2) Check whatever belongs to the theory of dynamical systems:
 - a) A group acting on a set.
 - b) Predict the future of systems and explore the limitations of this predictions.
 - c) Compute square roots of real numbers.
 - d) Understand the iteration of maps.

- 3) Look at the map $T(x) = x^2 + x$. Which of the following sequences form an **orbit** of x through $x = 1$:
 - a) 1, 6, 12, 20, 30, ...
 - b) 1, 2, 5, 30, ...
 - c) 0, 0, 0, 0, 0, ...
 - d) 2, 5, 30, 930, ...

- 4) Which of the following dynamical systems have a discrete time? We replace "map" or "differential equation" with "system".
 - a) Henon system
 - b) Van der Pool system
 - c) Standard system
 - d) Geodesic system
 - e) Billiard system.
 - f) Digits of π system.
 - g) Cellular automata system

- 5) Which of the following dynamical systems is the **Lorentz system**

- a) $\ddot{x} + x + (x^2 - 1)y = 0$.
- b)

$$\begin{aligned}\dot{x} &= 10(y - x) \\ \dot{y} &= -xz + 28x - y \\ \dot{z} &= xy - \frac{8z}{3}\end{aligned}$$

- c) $T \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 10(y - x) \\ z + 28x - y \\ xy - \frac{8z}{3} \end{bmatrix}$.

- 6) What is a semigroup?

- a) A set G with an operation $*$.
- b) A set G with an operation $*$ such that $(x * y) * z = x * (y * z)$.
- c) A set G with an operation $*$ such that $(x * y) * z = x * (y * z)$ with a neutral element e satisfying $x * e = x$.
- d) A set G with an operation $*$ such that $(x * y) * z = x * (y * z)$ with a neutral element e satisfying $x * e = x$ and such that for every x , there is a y such that $x * y = e$.

- 7) Which of the following sets are semigroups?

- a) The natural numbers.
- b) The set of words over a finite alphabet with the operation $v * w = vw$ of putting the words together.
- c) The set of all subsets of a finite set with the operation $A * B = A \cup B$.

- 8) Which of the following dynamical systems allow a numerical computation of the square root of 7:

- a) $T(x, y) = ((x + y)/2, 2xy/(x + y))$.
- b) $T(x) = \sqrt{x} - 7$.
- c) $T(x) = x^2 + 7$.

- 9) How could dynamical systems theory helped to save lives. Check each which apply:

- a) Predict wave heights from the strength of earthquakes triggering tsunamis.
- b) Predict the outcome of the lotto.
- c) Predict the sector in which the roulette ball falls.
- d) Predict the global warming on earth.