

Příklady k přednášce 1

Exercises for Lecture 1

1. Consider a system whose output is equal, at any instant of time, to the input: $y(t) = u(t)$, $t \in \mathbb{R}$. Is the system dynamical?
2. Consider the discrete-time system with input signal range $U = \mathbb{R}$, the field of real numbers, and output signal range $Y = \mathbb{Z}_2 = \{0, 1\}$, the field of residue classes modulo 2, where input u and output y are related by a relation R of the form

$$y(k) = 0, \quad \text{if } \sum_{l=-\infty}^k u(l) < 1 \\ = 1, \quad \text{otherwise.}$$

Is the system linear? Is it time-invariant?

3. Determine whether the following dynamical system is (a) linear, (b) time-invariant:

$$y(t) = u(e^t), \quad t \in \mathbb{R}.$$

4. Consider a system described by the Fibonacci equation

$$y(k+2) = y(k) + y(k+1), \quad k \in \mathbb{Z}$$

Is it a difference or differential system? Is it an input-output mapping system?

5. Given a differential system $\ddot{y}(t) = u(t) - \dot{y}(t)$, $t \in \mathbb{R}$. Determine a state and the state representation of the system.