

Příklady k přednášce 3
Exercises for Lecture 3

1. Determine all equilibrium points for the discrete-time system given by

$$\begin{aligned}x_1(k+1) &= x_1(k)x_2(k) - 1 \\x_2(k+1) &= 2x_1(k)x_2(k) - 2.\end{aligned}$$

2. Determine the set of equilibrium points of a system described by the differential equations

$$\begin{aligned}\dot{x}_1 &= x_1 - x_2 + x_3 \\ \dot{x}_2 &= x_1 + x_3 \\ \dot{x}_3 &= x_1 + x_2 + x_3.\end{aligned}$$

3. Is the equilibrium $x_e = 0$ of the system described by scalar-valued difference equation

$$x(k+1) = \sin x(k)$$

asymptotically stable?

4. Consider the harmonic oscillator described by the equation

$$\dot{x}(t) = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix} x(t), \quad t \geq 0.$$

Is it stable? Is it asymptotically stable?

5. Analyze the stability properties of the discrete-time system given by

$$x(k+2) + x(k) = u(k), \quad y(k) = x(k)$$

where x , y and u are scalar-valued variables. Is the system BIBO stable?