Universitatea Babeş-Bolyai, Facultatea de Matematică şi Informatică

Secţia: Informatică engleză

Curs: Dynamical Systems

Primăvara 2024

Seminar 5

1. We consider the linear planar systems

a) $\dot{x} = -y,\ \dot{y} = 5x$; b) $\dot{x} = -x,\ \dot{y} = 5y$;

c) $\dot{x} = -3x,\ \dot{y} = -2y$; d) $\dot{x} = x - y,\ \dot{y} = x + y$.

(i) Decide the type and stability of the equilibrium point at the origin.

(ii) Decide whether it has a global first integral.

(iii) Find a first integral (global or not). (except for d))

(iv) Represent the phase portrait (using the expression of the first integral). (except for d)) $\diamond$

2. We consider the nonlinear planar system

$\dot{x} = x(1 - x),\ \dot{y} = y(3 - y)$.

Study the stability of its equilibrium points. $\diamond$

3. (i) For what values of the real parameter a, the system $\dot{x} = ax - 5y,\ \dot{y} = x - 2y$ has a center? In that cases find the general solution of the system.

(ii) For what values of the real parameter a, the system from (i) has a line filled with equilibrium points? $\diamond$