Universitatea Babeş–Bolyai
Facultatea de Matematică şi Informatică

Exam on Dynamical Systems.
June 24, 2011

1. (2.5p) We say that a differential equation exhibit resonance when all its solutions are unbounded.

For what values of the mass m will $mx'' + 25x = 12\cos(36\pi t)$ exhibit resonance?

2. (0.75p) Find the general solution of the following differential equation

$$t^2x'' - 3tx' + 3x = 0.$$

3. We consider the differential system $x' = -x, \quad y' = -3y.$

a) (0.5p) Find its general solution.

b) (0.5p) What is the type of its equilibrium point $(0, 0)$?

c) (0.5p) Find a first integral.

d) (0.5p) Represent its phase portrait.

4. (0.75p) Write the statement of the Stability Theorem in First Order Approximation for an equilibrium point of a nonlinear planar system.