



**81st International Scientific
Conference of the
University of Latvia 2023**

Boundary Value Problems for Ordinary Differential Equations

Book of Abstracts



Institute of Mathematics and Computer Science
University of Latvia

Interval of the existence of positive solutions for a second-order Dirichlet boundary value problem

A. Antoņuks, A. Grigorjeva

We determine the interval of the existence of positive solutions for a nonlinear second-order boundary value problem with Dirichlet boundary conditions. Krasnoselskii's fixed point theorem is used to determine this interval theoretically. We compare theoretical results with results obtained graphically.

A remark on oscillatory properties of solutions to the second order nonlinear ODE

S. Atslēga, F. Sadirbajevs

Estimates of the periods of solutions to the Lienard type equations with quadratic dependence on x' are given.

On a boundary value problem with the Arrhenius nonlinearity

A. Gricāns, A. Koliškis, I. Jermačenko, D. Ogorelova, F. Sadirbajevs, I. Samuilik

We consider a boundary value problem consisting of a second order ordinary differential equation containing the Arrhenius nonlinearity and mixed boundary conditions. By bifurcation analysis, we study the multiplicity of positive solutions of the problem.

Boundary value problems for Lienard type equations

A. Kiričuka

Boundary value problems for the equations of the type $x'' + f(x)(x')^2 + g(x) = 0$ and $x'' + f(x)x' + g(x) = 0$ are considered. Differences in the estimates of the number of solutions are discussed.

On critical points of the three-dimensional dynamical system arising in the theory of genetic networks

O. Kozlovska, F. Sadirbajevs

For the three-dimensional system of ordinary differential equations, arising in the theory of genetic networks, the results of the calculation of the characteristics of critical points are provided.

On computation of parameters in Artificial Neural Networks mathematical models

D. Ogorelova

3D-model of the artificial neural network is considered where the sigmoidal function is the Hyperbolic tangent function. The linearization at a critical point and the results of the calculation of the characteristics of critical points are provided.

Remarks on Kaplan-Yorke dimension in search of chaotic behavior

I. Samuilik

There is a relationship between the Lyapunov exponents and the dimension. Now many have accepted the Kaplan-York hypothesis, according to which the dimension of the attractor, called the Lyapunov dimension, is expressed in terms of the spectrum of Lyapunov exponents. To use the Kaplan-Yorke formula, the Lyapunov exponents must be arranged in descending order.

Variable regulatory matrix

V. Sengileyev

We consider Genetic Regulatory Network 3D system with a variable regulatory matrix.

About Fučík type problem with Robin condition

N. Sergejeva

We provide the implicit description of the Fučík spectrum for the problem with Robin condition with the implicit description with inequality type conditions, that allow to control the nodal properties of corresponding non-trivial solutions.

Existence of multiple positive solutions for a third-order boundary value problem with nonlocal conditions

S. Smirnovs

We study the existence of multiple positive solutions for a nonlinear third-order differential equation subject to various nonlocal boundary conditions. The boundary conditions that we study, contain Stieltjes integral and include the special cases of m -point conditions and integral conditions. The main tool in the proof of our result is Krasnosel'skii's fixed point theorem. To illustrate the applicability of the obtained results, we consider examples.