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The 3rd International Workshop

# Boundary Value Problems, Functional Equations and Applications

Rzeszów, Poland, April 20-23, 2016  
Abstracts

University of Rzeszów

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# Preface

Dear Colleagues,

Welcome to the University of Rzeszów and the 3rd International Workshop *Boundary Value Problems, Functional Equations and Applications* (BFA3). The meeting is devoted to recent research in the field of differential and functional equations, complex and real analysis, with a special emphasis on topics related to boundary value problems and their applications. The conference is included in the series of conferences associated with the International Society for Analysis, its Applications and Computation (ISAAC). The venue of the workshop is the University of Rzeszów which is the biggest academic institution in Podkarpackie voivodeship situated in southeastern Poland. Two previous editions of the workshop took place in Kraków, in 2008 and 2010.

This book contains the abstracts of scientific contributions of the participants of the 3rd International Workshop Boundary Value Problems, Functional Equations and Applications. We would like to thank all our dear colleagues who contributed with their presentations. Special thanks go to the plenary speakers: Professor Mirosław Lachowicz, Professor Mohamed M. S. Nasser, Professor Irena Rachůnková, Professor Alexander Soldatov and Professor Eugeniusz Szeregij.

We highly appreciate the financial support received from the **ISAAC**, **Eurotech** and **OPTeam**.

Our conference is also sponsored by:

- The Rector of the University of Rzeszów – Professor Sylwester Czopek,
- The Dean of the Faculty of Mathematics – Professor Ołeh Łopuszański,
- The Marshal of the Podkarpackie Voivodeship – Władysław Ortyl,
- The President of Rzeszów – Tadeusz Ferenc,
- Aviation Valley,
- TVP Rzeszów.

We believe that you will find the workshop a good opportunity for research, discussions and informal meetings.

Rzeszów, April 20, 2016

Piotr Drygaś  
Vladimir Mityushev  
Barbara Sobek  
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# Organization

The 3rd International Workshop Boundary Value Problems, Functional Equations and Applications (BFA3 2016) is organized by the Faculty of Mathematics and Natural Sciences, University of Rzeszów, Poland.

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# Immersion principle for boundary value problem for ordinary differential equations

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A constructive solution method for boundary problem for ordinary differential equation is supposed on the base of constructing a general solution of the Fredholm integral equation of the first kind. We consider the following boundary value problem

$$\dot{x} = A(t)x + B(t)f(x, t) + \mu(t), t \in I = [t_0, t_1], \quad (1)$$

with boundary conditions  $(x(t_0), x(t_1)) \in S \subset R^{2n}$  and phase restrictions  $x(t) \in G(t) : G(t) = \{x \in R^n | \gamma(t) \leq F(x, t) \leq \delta(t), t \in I\}$ , where  $A(t), B(t)$  are prescribed matrixes with piecewise-continuous elements of the orders  $n \times n, n \times m$  correspondingly,  $\mu(t), t \in I$  is prescribed  $n$ -dimensional vector-function with piecewise-continuous components,  $f(x, t)$  is  $m$ -dimensional vector-function, defined and continuous by variables  $(x, t) \in R^n \times I$  and satisfied to the conditions:  $|f(x, t) - f(y, t)| \leq l|x - y|, \forall (x, t), (y, t) \in R^n \times I, l = \text{const} > 0, |f(x, t)| \leq C_0|x| + C_1(t), C_0 = \text{const} \geq 0, C_1(t) \geq 0, C_1(t) \in L_1(I, R^1)$ . Here  $S$  are prescribed convex closed sets. The problem is formulated: Find necessary and sufficient conditions for existing a solution of the problem (1).

1. A. N. Tikhonov, A. B. Vasileva, A. G. Sveshnikov, *Differential equations*, - M.: Science, 1985, p. 231.
2. S. A. Aisagaliev, *General solution of a class integral equations*, Mathematical Journal, Institute of Mathematics MES RK 5 (2005), 7–13.