ABSTRACTS

F.G. Avkhadiev, P.L. Shabalin

Conformal mappings of circular domains on finitely-connected non-Smirnov type domains

Abstract. We consider a canonical factorization and integral representation for the derivatives of conformal mappings of circular domains on finitely-connected non-Smirnov type domains. By means of the functions in the Zygmund class, we obtain the conditions of global one-sheeted property. Earlier similar results were obtained by a series of authors just for simply-connected domains.

Keywords: Non-Smirnov type domain, Zygmun condition, Schwarz operator

I.N. Braeutigam, K.A. Mirzoev, T.A. Safonova

On deficiency index for second order vector differential operators

Abstract. In this paper we consider the operators generated by the second order matrix linear symmetric quasi-differential expression

$$l[y] = -(P(y' - Ry))' - R^*P(y' - Ry) + Qy$$

on the set $[1, +\infty)$, where $P^{-1}(x)$, $Q(x)$ are Hermitian matrix functions and $R(x)$ is a complex matrix function of order n with entries $p_{ij}(x), q_{ij}(x), r_{ij}(x) \in L^1_{loc}[1, +\infty)$ $(i, j = 1, 2, \ldots, n)$. We describe the minimal closed symmetric operator L_0 generated by this expression in the Hilbert space $\mathcal{L}^2_n[1, +\infty)$. For this operator we prove an analogue of the Orlov's theorem on the deficiency index of linear scalar differential operators.

Keywords: Quasi-derivative, quasi-differential expression, minimal closed symmetric differential operator, deficiency numbers, asymptotic of the fundamental system of solutions.

M.M. Dyshaev, V.E. Fedorov

Symmetries and exact solutions of a nonlinear pricing options equation

Abstract. We study the group structure of the Schönbucher–Wilmott equation with a free parameter, which models the pricing options. We find a five-dimensional group of equivalence transformations for this equation. By means of this group we find four-dimensional Lie algebras of the admitted operators of the equation in the cases of two free element specifications and we find a three-dimensional Lie algebra for other nonequivalent specifications. For each algebra we find optimal systems of subalgebras and the corresponding invariant solutions or invariant submodels.

Keywords: nonlinear partial differential equation, nonlinear Black–Scholes equation, Schönbucher–Wilmott model, pricing options, group analysis, invariant solution.

S.V. Zakharov, A.E. Elbert

MODELLING COMPRESSION WAVES WITH A LARGE INITIAL GRADIENT IN THE KORTEWEG–DE VRIES HYDRODYNAMICS

Abstract. We consider the Cauchy problem for the Korteweg-de Vries equations with a small parameter at the higher derivative and a large gradient of the initial function. By means of the numerical and analytic methods we show that the formal asymptotics obtained by a renormalization is an asymptotic solution to the KdV equation. We obtain the graphs of the asymptotic solutions including the case of non-monotone initial data.

Keywords: Korteweg-de Vries equation, Cauchy problem, compression wave

O.Kh. Karimov

ON COERCIVE PROPERTIES AND SEPARABILITY OF THE BIHARMONIC OPERATOR WITH MATRIX POTENTIAL

Abstract. In the work we consider the coercive properties of a nonlinear biharmonic operator with a matrix operator in the space $L_2(R^n)^l$ and we prove its separability in this space. The considered nonlinear operators are not small perturbation of linear operators. The case of the linear biharmonic operator is considered separately.

Keywords: biharmonic differential operator, matrix potential, coercive inequalities, nonlinearity, separability.

A.I. Kozhanov, R.R. Safiullova

DETERMINATION OF PARAMETERS IN TELEGRAPH EQUATION

Abstract. We study the solvability of the inverse problems on finding a solution $u(x,t)$ and an an unknown coefficient c for a telegraph equation

$$u_{tt} - \Delta u + cu = f(x,t).$$

We prove the theorems of the existence of the regular solutions. The feature of the problems is a presence the new overdetermination conditions for the considered class equations.

Keywords: telegraph equation, unknown coefficient, inverse problems, special type integral overdetermination, regular solutions, existence.

E. Mukhamadiev, A.N. Naimov, A.Kh. Sattorov

ANALOGUE OF BOHL THEOREM FOR A CLASS OF LINEAR PARTIAL DIFFERENTIAL EQUATIONS

Abstract. We study the issue on the existence and uniqueness of a solution bounded in the entire space for a class of higher order linear partial differential equations. We prove the theorem on the necessary and sufficient condition for the existence and uniqueness of a bounded solution for a studied class of equations. This theorem is an analogue of the Bohl theorem known in the theory of ordinary differential equations. In a partial case the unique solvability conditions are expressed in terms of the coefficients of the equation and we provide the integral representation for the bounded solution.

R.G. Nasibullin

Sharp Hardy type inequalities with weights depending on Bessel function

Abstract. We obtain a new sharp Hardy type inequality with weights. Using the Bessel functions we prove Lp one dimensional inequality and their multidimensional analogs in convex domains. The weight functions depend on the Bessel functions and LambвЪ™s constants.

We prove exact Hardy type inequalities with the weights depending on a Bessel function. We obtain one-dimensional L^p-inequalities and provide an example of extending these inequalities for the case of convex domains with a finite inner radius. The proved statements are generalization for the case of arbitrary $p \geqslant 2$ of the corresponding inequality proved by F.G. Avkhadiev and K.-J. Wirths for $p = 2$.

I.V. Rakhmelevich

On multi-dimensional partial differential equations with power nonlinearities in first derivatives

Abstract. We consider a class of multidimensional partial differential equations involving a linear differential operator of arbitrary order and power nonlinearity in the first derivatives. Under some additional assumptions for this operator, we study the solutions of multidimensional travelling waves that depend on some linear combinations of the original variables. The original equation is transformed to a reduced one, which can be solved by separation of variables. Solutions of the reduced equation are found for the cases of additive, multiplicative and combined separation of variables.

B.T. Bilalov, T.B. Gasymov

On basicity of a system of eigenfunctions of second order discontinuous differential operator

Abstract. We consider a spectral problem for a second order discontinuous differential operator with spectral parameter in the boundary condition. We present a method for establishing the basicity of eigenfunctions for such problem. We also consider a direct expansion of a Banach space with respect to subspaces and we propose a method for constructing a basis for a space by the bases in subspaces. We also consider the cases when the bases for subspaces are isomorphic and the corresponding isomorphisms are not needed. The completeness, minimality and uniform minimality of the corresponding systems are studied. This approach has extensive applications in the spectral theory of discontinuous differential operators.

A.Ya. Khrystiyanyn, O.S. Vyshyns'kyi

Growth regularity for the arguments of meromorphic in $\mathbb{C} \setminus \{0\}$ functions of completely regular growth

Abstract. We study the asymptotic behaviour for the arguments of meromorphic function in $\mathbb{C} \setminus \{0\}$ of completely regular growth with respect to a growth function λ. We find that that the key role in the description of this behaviour is played by the function $\lambda_1(r) = \int_1^r \lambda(t)/t\, dt$.