

Abstracts

2020 MSC. 34A34, 34A45, 34B15

S. M. Chuiko, O. V. Nesmelova. **On the reduction of an autonomous nonlinear boundary value problem unsolved with respect to the derivative to the first-order critical case** // Ukrainian Mathematical Bulletin, **20** (2023), No. 4, 460–484.

Constructive solvability conditions and a scheme for constructing solutions of an autonomous nonlinear boundary value problem unsolved with respect to the derivative have been found. A convergent iterative scheme for finding approximations to the solutions of a nonlinear autonomous nonlinear boundary value problem unsolved with respect to the derivative was constructed by reducing the problem to the first-order critical case. As an example of application of the constructed iterative scheme, approximations to the solutions of a periodic boundary value problem for the autonomous Lotka–Volterra equation were determined.

References. 30

2010 MSC. 34B05

S. M. Chuiko, O. V. Nesmelova, V. O. Kuz'mina. **Generalized Green's operator of the matrix integral-differential boundary value problem unsolved with respect to the derivative** // Ukrainian Mathematical Bulletin, **20** (2023), No. 3, 336–349.

Solvability conditions and a structure of the generalized Green's operator of a linear Noether boundary value problem for a matrix integral-differential system unsolved with respect to the derivative, which generalizes integral-differential systems of the Fredholm type with a degenerate kernel. To solve the matrix integral-differential boundary value problem unsolved with respect to the derivative, original solvability conditions were used, as well as the structure of the general solution of the Sylvester-type matrix equation.

References. 14

2010 MSC. Primary 33C20, 33C65; Secondary 44A20

T.G. Ergashev, A. Hasanov, T. K. Yuldashev. **Euler-type integral representations for the Kampé de Fériet functions** // Ukrainian Mathematical Bulletin, **20** (2023), No. 4, 485–504.

In this paper, the Kampé de Fériet functions of arbitrary orders and their Euler-type integral representations are studied. The general form of the integral representations for a Kampé de Fériet function are proved. Conditions, under which these representations are expressed in terms of products of two generalized hypergeometric functions, are found. Examples are identified in which the integral representation of the Kampé de Fériet function contains an elementary function or a known second-order hypergeometric function of two variables.

References. 39

2010 MSC. Primary 30C62, 30C65, 30E25; Secondary 35J25, 76-02

V. Gutlyanskiĭ, V. Ryazanov, R. Salimov, E. Sevost'yanov. **On divergence type linear and quasilinear equations in the complex plane** // Ukrainian Mathematical Bulletin, **20** (2023), No. 4, 505–543.

This is a survey of our recent results concerning divergence-type linear and quasi-linear equations in the complex plane. It contains a number of existence, representation, and regularity theorems for the solutions of fundamental boundary value problems for such equations. The degeneration case of uniform ellipticity is also covered by means of the BMO, VMO, Calderon–Zygmund, Lehto, and Orlicz technics.

References. 78

2020 MSC. 41A65, 41A17, 41A44

O. Kovalenko. **On a general approach to some problems of approximation of operators** // Ukrainian Mathematical Bulletin, **20** (2023), No. 4, 544–556.

A general scheme for solving some approximation problems under a rather general setting has been proposed. The application of the proposed scheme is illustrated by a series of examples. In particular, it is shown that many results in the area of Ostrowski-type inequalities can be obtained by standard arguments.

References. 14

2020 MSC. Primary: 30C55, 30C62, 30F60; Secondary 30C80, 32G15, 46G20

S. L. Krushkal. **Analytic and geometric quasiinvariants of convex curvilinear polygons with infinite number of vertices** // Ukrainian Mathematical Bulletin, **20** (2023), No. 4, 557–576.

Establishing and evaluation of values of the basic curvilinear quasiinvariants of Jordan curves still remains an important problem of geometric and quasiconformal analysis, especially for applications. It is not solved completely even for polygonal domains. The most general known results were established for unbounded polygons with locally smooth boundaries containing the infinite point and having only a finite number of vertices.

The present paper deals with convex polygonal domains having infinite (countable) number of vertices. It creates a new approach in this direction

and establishes that quasiinvariants of such polygons are estimated by their geometric characteristics.

References. 29

2010 MSC. Primary 60K15; Secondary 60K99

A. A. Pogorui, R. M. Rodríguez-Dagnino. **Isotropic evolution process with Gauss-distributed particle position in \mathbb{R}^d** // Ukrainian Mathematical Bulletin, **20** (2023), No. 4, 577–585.

In this work we study an isotropic random motion of a particle when the velocity of such a particle has the Maxwell–Boltzmann distribution. We give some specific results for the one-dimensional, three-dimensional, and d -dimensional cases. In all these case the particle position in a given time t is Normal or Gauss distributed.

References. 7

2020 MSC. 05C12, 54C65

I. Protasov. **Coarse selectors of graphs** // Ukrainian Mathematical Bulletin, **20** (2023), No. 4, 586–592.

We consider a connected graph Γ as a coarse space and prove that Γ admits a 2-selector if and only if Γ is either bounded or coarsely equivalent to \mathbb{N} or \mathbb{Z} . We apply this result to geodesic metric spaces admitting the linear orders compatible with coarse structures.

References. 9

2010 MSC. 46E30, 42A10, 41A17, 41A20, 41A25, 41A27, 41A30

V. V. Savchuk, S. O. Chaichenko, A. L. Shydlich. **Extreme problems of weight approximation on the real axis** // Ukrainian Mathematical Bulletin, **20** (2023), No. 4, 593–606.

The exact value was calculated and the polynomial for the best weighted polynomial approximation was found for the kernels of the form $\frac{A+Bx}{(x^2+\lambda^2)^2}$, where $A, B \in \mathbb{R}$ and $\lambda > 0$, in the root-mean-square metric.

References. 7