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Abstracts

2010 MSC. 54E35

V. Bilet, O. Dovgoshey. **Finite spaces pretangent to metric spaces at infinity** // Ukrainian Mathematical Bulletin, **15** (2018), No. 4, 448–474.

Let X be an unbounded metric space, and let $\tilde{r}$ be a sequence of positive real numbers tending to infinity. We define the pretangent space $\Omega^X_{\infty,\tilde{r}}$ to X at infinity as a metric space whose points are the equivalence classes of sequences $\tilde{x} \subset X$ which tend to infinity with the rate $\tilde{r}$. It is proved that all pretangent spaces are complete and, for every finite metric space Y, there is an unbounded metric space X such that Y and $\Omega^X_{\infty,\tilde{r}}$ are isometric for some $\tilde{r}$. The finiteness conditions of $\Omega^X_{\infty,\tilde{r}}$ are completely described.

References. 28

2010 MSC. 34A09, 34B, 65B10

S. M. Chuiko. **The method of least squares in the theory of Noetherian differential-algebraic boundary-value problems** // Ukrainian Mathematical Bulletin, **15** (2018), No. 4, 475–489.

The conditions of existence and the construction of pseudosolutions, being the best by the method of least squares, of a differential-algebraic boundary-value problem and a differential-algebraic system with lumped delay, respectively, are determined.

References. 18

2010 MSC. Primary 47B36; Secondary 47B50; 42C05; 15A23

I. M. Kovalyov. **Shifted Darboux transformations of the generalized Jacobi matrices, I** // Ukrainian Mathematical Bulletin, **15** (2018), No. 4, 490–515.

Let $\mathfrak{J}$ be a monic generalized Jacobi matrix, i.e., a three-diagonal block matrix of a special form. We find conditions for a monic generalized Jacobi matrix $\mathfrak{J}$ to admit a factorization $\mathfrak{J} = \mathfrak{L}\mathfrak{U} + \alpha I$ with $\mathfrak{L}$ and $\mathfrak{U}$ being lower and upper triangular two-diagonal block matrices of special forms. In this case, the shifted parameterless Darboux transformation of $\mathfrak{J}$ defined by $\mathfrak{J}^{(p)} = \mathfrak{U}\mathfrak{L} + \alpha I$ is shown to be also a monic generalized Jacobi matrix. Analogs of the Christoffel formulas for polynomials of the first and second kinds corresponding to the Darboux transformation $\mathfrak{J}^{(p)}$ are found.

References. 26

2000 MSC. 55P55, 55P62.

V. V. Marchenko. **Rational homotopic theory of spaces 1-connected by shape** // Ukrainian Mathematical Bulletin, **15** (2018), No. 4, 516–535.

A rational shape type and a strong rational shape type are defined for the class of spaces 1-connected by shape. This class is a natural generalization of the class of 1-connected spaces for which the rational homotopic theory was constructed in work [10]. With the use of the category of inverse systems, the result in [10] on the equivalence of homotopic theories is extended onto the class of spaces 1-connected by shape.

References. 12

2010 MSC. 34E10, 34D15

A. S. Omuraliev, E. D. Abylaeva. **Ordinary differential equations with power boundary layers** // Ukrainian Mathematical Bulletin, **15** (2018), No. 4, 536–542.

The regularized asymptotics of a solution of the Cauchy problem for systems of singularly perturbed ordinary differential equations is constructed. It is shown that a power boundary layer appears in such problems in addition to other boundary layers.

References. 7

2010 MSC. 30G35, 35J05, 31A30

S. A. Plaksa. **Monogenic functions in commutative algebras associated with classical equations of mathematical physics** // Ukrainian Mathematical Bulletin, **15** (2018), No. 4, 543–575.

The methods involving the functions analytic in a complex plane for plane potential fields inspire the search for the analogous efficient methods for solving the spatial and multidimensional problems of mathematical physics. Many such methods are based on the mappings of hypercomplex algebras. The essence of the algebraic-analytic approach to elliptic equations of mathematical physics consists in the finding of a commutative Banach algebra such that the differentiable functions with values in this algebra have components satisfying the given equation with partial derivatives. The use of differentiable functions given in commutative Banach algebras combines the preservation of basic properties of analytic functions of a complex variable for the mentioned differentiable functions and the convenience and the simplicity of construction of solutions of PDEs. The paper contains the review of results reflecting the formation and the development of the mentioned approach.

References. 101

2010 MSC. 35K59, 35B44, 35K58, 35K65

Ye. O. Yevgenieva. **Quasilinear parabolic equations with a degenerate absorption potential** // Ukrainian Mathematical Bulletin, **15** (2018), No. 4, 576–591.

Quasilinear parabolic equations with a degenerate potential of absorption are considered. The estimates of all weak solutions of such equations, including large solutions satisfying the blow-up conditions on the parabolic boundary of a domain, are obtained.

References. 20