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INTERNATIONAL CONFERENCE ON

" OPERATORS IN MORREY-TYPE SPACES AND APPLICATIONS"

DEDICATED TO 60th BIRTHDAY OF PROFESSOR VAGIF S. GULIYEV

ABSTRACTS BOOK

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Preface

The international conference "Operators in Morrey-type Spaces and Applications" (OMTSA 2017), dedicated to 60^{th} birthday of Professor Vagif Sabir GULIYEV, will be held at the Ahi Evran University (Kırşehir, Turkey) through 10-13 July 2017. One of the most active researchers in general Morrey-type spaces who initiated new developments in this direction and obtained together with his collaborators a number of important results is Professor V.S. Guliyev, who will be 60 in 2017.

The first conference "OMTSA 2011" has been held at the Ahi Evran University (Kırşehir, Turkey) in 2011 and was dedicated to 70^{th} birthday of Professor V.I. Burenkov.

Kırşehir city, which was a scene for various civilizations for thousands of years, is not only drawing attention due to various historical pieces of art, underground cities, but also due to its rich thermal sources and natural beauties like Seyfe Lake (Bird Paradise). Among mathematicians Kırşehir is also known as one of centers of active investigations on the theory of operators in Morrey-type spaces.

Morrey spaces were introduced by C. Morrey in 1938. They appeared to be quite useful in the study of local behaviour of the solutions of elliptic partial differential equations. The theory of boundedness of classical operators of real analysis, such as maximal operator, fractional maximal operator, Riesz potential, singular integral operator etc, from one weighted Lebesgue space to another one is by now well studied. These results have good applications in the theory of partial differential equations. However, it should be noted that in the theory of partial differential equations, along with weighted Lebesgue spaces, general Morrey-type spaces also play an important role.

In the nineties of the XX century an active study of general Morrey type spaces started which are characterized by a functional parameter. In particular, Professor V.S. Guliyev in his doctoral thesis (1994) introduced local and complementary local Morrey-type spaces and studied the boundedness in these spaces of fractional integral operators and singular integral operators defined on homogeneous Lie groups. A number of results on boundedness of classical operators in general Morrey type spaces were obtained by several authors. However in all these results only sufficient conditions on the functional parameters, characterizing general Morrey-type spaces, ensuring boundedness, were obtained.

At the beginning of the XXI century there were new active developments in this area. In particular, Professor V.S. Guliyev, jointly with professor V.I. Burenkov, has developed a new perspective trend in harmonic analysis, related to the study of classical operators in general spaces of Morrey type. The significance of the developed methods lies in the fact that they allow to obtain necessary and sufficient conditions for the boundedness of classes of singular type operators with the subsequent application to the obtaining more precise estimates for solutions to elliptic and parabolic partial differential equations. As a result, for a certain range of the numerical parameters necessary and sufficient conditions were obtained on the functional parameters ensuring boundedness of classical operators of Real Analysis (maximal operator, fractional maximal operator, Riesz potential, genuine singular integrals) from one general local Morrey-type space to another one. Results of such type are very important for the development of contemporary Real Analysis and its applications first of all to Partial Differential Equations. Many well-known mathematicians participated in these activities and their results were published in leading mathematical journals and presented at numerous international conferences.

An important role was played by the international conference OMTSA 2011, two volumes of proceeding of which were published in the Eurasian Mathematical Journal. The modern state of the theory of operators in Morrey type spaces was presented and discussed in detail. OMTSA 2011 gave a boost for further developments of this theory and in recent years a number of new results were obtained in this field. In a series of papers action of numerous operators was investigated in various function spaces of Morrey type: general local and global Morrey-type spaces, local Morrey-Lorentz spaces, generalized Morrey spaces with variable exponent, generalized Orlicz-Morrey spaces, etc, by V.S. Guliyev and his co-workers (V. Burenkov, S. Samko, A. Gogatishvili, L. Softova, Y. Sawano, M.A. Ragusa, A. Serbetci, R. Mustafayev, A. Najafov, J. Hasanov, I. Ekincioglu, A. Akbulut, Y.Y. Mammadov, C. Aykol, O.N. Omarova, F. Deringoz, A. Kucukaslan and others).

Despite profound recent progress in this area there are still many urgent open problems. For this reason it is of extreme importance and value to organize a conference on this subject. At the conference new results and future challenges will be discussed in a series of invited and short talks and workshops. Moreover, this will allow to present open problems on Morrey type spaces to wider a mathematical community in Turkey.

We hope that all mathematicians actively working in this area (including a number of mathematicians in Turkey) and mathematicians who work in close proximity and who want to participate in research on spaces of Morrey type and applications will attend the

conference. We expect that qualified and young researches from the Ahi Evran University and other mathematical institutions in Turkey will be interested to participate in this conference and will find new topics for their research, especially for their graduate and post-graduate studies.

On behalf of the Organizing Committee
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Assoc. Prof. Dr. Ali AKBULUT

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Director of Nikolskii Institute of Mathematics,
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Kırşehir , TURKEY

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Plenary Speakers

Fixed Point Theory and Dynamics-Chaotic Behaviors of Function Iteration Process

Vatan Karakaya, Derya Sekman
Yıldız Technical University Turkey, University of Ahi Evran Turkey

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Abstract

In this presentation, the main idea is to execute connection between fixed point theory and the other branches of mathematics for benefit of reader. We are going to talk about some application areas of fixed point theory as dynamical system.

Keywords
Dynamical system, Fixed point theory

Interpolation theory and local Morrey-type spaces

Victor I. Burenkov
SM Nikol'skii Institute of Mathematics
RUDN University Russia

Abstract

The real interpolation method will be under discussion. Recently it was proved that for local Morrey-type spaces, in contrast to global Morrey-type spaces, in the case when they have the same integrability parameter, the interpolation spaces are again local Morrey-type spaces with appropriately chosen parameters.

This result is a particular case of the interpolation theorem for much more general spaces defined with the help of an operator acting from some function space to the cone of nonnegative nondecreasing functions on $(0,\infty)$.

All classical interpolation theorems due to SteinWeiss, Peetre, Calderon, Gilbert, Lizorkin, Freitag and some of their new variants can be derived from this theorem.

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Characterizations for the Riesz potential and its commutators on Orlicz and generalized Orlicz-Morrey spaces

Vagif S. Guliyev
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Abstract

In the present talk, we shall give necessary and sufficient conditions for the strong and weak boundedness of the Riesz potential operator I_α on Orlicz and generalized Orlicz-Morrey spaces. Cianchi [1] found necessary and sufficient conditions on general Young functions Φ and Ψ ensuring that this operator is of weak or strong type from L^Φ into L^Ψ. Our characterizations for the boundedness of the above-mentioned operator are different from the ones in [1]. As an application of these results, we consider the boundedness of the commutators of Riesz potential operator $[b, I_\alpha]$ on Orlicz and generalized Orlicz-Morrey spaces when b belongs to the BMO and Lipschitz spaces, respectively.

Keywords

Orlicz space; generalized Orlicz-Morrey space; Riesz potential; commutator

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This contribution is based on recent joint work with F. Deringoz and S. H. Hasanov.

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Invited Speakers

The extrapolation theorems for weighted generalized Morrey spaces

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Tengiz Kopaliani
Faculty of Exact and Natural Sciences Tbilisi State University
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Abstract

We give extension of the extrapolation theorem of Rubio de Francia for weighted generalized Morrey space.

Let $1 \leq p < \infty$. Let be φ a positive measurable function on $\mathbb{R}^n \times (0, \infty)$, non-decreasing with respect to r for every $x \in \mathbb{R}^n$ and w weighted function defined on $\mathbb{R}^n$. We define a weighted generalized Morrey space $\mathcal{M}_{p,\varphi}(w)$ by

$$\mathcal{M}_{p,\varphi}(w) := \left\{ f \in L^{\mathrm{loc}}_{p,w}(\mathbb{R}^n) \quad \|f\|_{\mathcal{M}_{p,\varphi}(w)} < \infty \right\},$$

where

$$\|f\|_{\mathcal{M}_{p,\varphi}(w)} := \sup_{x \in \mathbb{R}^n,\, r>0} \left(\frac{1}{\varphi(x,r)} \int_{B(x,r)} |f(y)|^p w(y) dy \right)^{\frac{1}{p}}.$$

We have following Theorem

Given a family $\mathcal{F}$, suppose that for some p, δ, $0 < p < \infty$, $0 < \delta \leq 1$, and for every weight $w \in A_1$

$$\int_{\mathbb{R}^n} f(x)^p w^\delta(x) dx \leq C_0 \int_{\mathbb{R}^n} g(x)^p w^\delta(x) dx, \quad (f,g) \in \mathcal{F}.$$

Let $w \in A_1$ such that

$$\sum_{k=1}^{\infty} \frac{\varphi(x, 2^k r) |B(x, 2^k r)|^{\varepsilon_0}}{w(B(x, 2^k r))^\delta} \leq C_1 \frac{\varphi(x,r) |B(x,r)|^{\varepsilon_0}}{w(B(x,r))^\delta}$$

for every $x \in \mathbb{R}^n$ and $r > 0$, and for some $\varepsilon_0 > 0$. Then for all $(f,g) \in \mathcal{F}$

$$\|f\|_{\mathcal{M}_{p,\varphi}(w^\delta)} \leq C_2 \|g\|_{\mathcal{M}_{p,\varphi}(w^\delta)}.$$

As a consequence we obtain conditions guarantee boundedness of many classical operators in harmonic analysis singular integral operators with rough kernels, fractional maximal operators related to spherical means, Bochner-Riesz operators in weighted generalized Morrey spaces.

Keywords

weighted generalized Morrey spaces, Rubio de Francia extrapolation theorem, Muckenhoupt weights, spherical maximal operator, singular integral operators with rough kernels, fractional maximal operators related to spherical means, strongly singular integrals, Bochner-Riesz operators, commutators of Calderón-Zygmund singular integral operator

Integral Operators of Harmonic Analysis in Local Morrey-Lorentz Spaces

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Abstract

In a series of papers by the author jointly with his co-authors V.S. Guliyev, C. Aykol, A. Kucukaslan the local Morrey-Lorentz spaces $M^{loc}_{p,q;\lambda}(R^n)$ have been introduced and the basic properties of these spaces have been given, and the boundedness of the Hilbert transform H, the Hardy-Littlewood maximal operator M and the Calderon-Zygmund operators T, and Riesz potential I_α on the spaces $M^{loc}_{p,q;\lambda}(R^n)$ has been extensively studied. This talk is dedicated to these results obtained by the author jointly with his co-authors. The basic properties of the local Morrey-Lorentz spaces $M^{loc}_{p,q;\lambda}(R^n)$ will be given. The boundedness of classical operators of harmonic analysis, such as Hilbert transform H, the Hardy-Littlewood maximal operator M, the Calderón-Zygmund operators T, and Riesz potential I_α will be proved on the spaces $M^{loc}_{p,q;\lambda}(R^n)$.

Keywords

Local Morrey-Lorentz spaces, Hilbert transform, Hardy-Littlewood maximal operator, Calderón-Zygmund operators, Riesz potential

Morrey type spaces over unbounded domain

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Abstract

Let $\Omega \subset \mathbb{R}^n, n \geq 2$ be an unbounded domain. In [1] Transirico, Troisi and Vitolo introduced spaces of Morrey type related to the study of elliptic boundary value problems in unbounded domains. Our goal is to extend these results in weighted spaces $M^{p,w}(\Omega; d)$ defined over functions $f \in L^p_(loc)(\Omega), p \in [1, \infty)$, for which

$$\|f\|_{M^{p,w}(\Omega;d)} = \sup_{x\in\Omega,\rho\in(0,d]} \left(\frac{1}{w(x,\rho)} \int_{\Omega\cap\mathcal{B}_\rho(x)} |f(y)|^p dy \right)^{1/p} < +\infty$$

where $d \in (0, +\infty)$ and $w : \mathbb{R}^n \times \mathbb{R}_+ \to \mathbb{R}_+$ is a measurable function satisfying suitable conditions. For this purpose we study in [2] the properties of $M^{p,w}(\Omega; d)$ and their subspaces $\widetilde{M}^{p,w}(\Omega; d)$ and $M^{p,w}(\Omega; d)$. The first one is a closure of $L^\infty(\Omega)$ while the second one is the closure of $C_0^\infty(\Omega)$ with respect to the norm in $M^{p,w}(\Omega; d)$.

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On some Morrey regularity results for minimizers of variational integrals

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Abstract

The author shows some results obtained in cooperation with Atsushi Tachikawa. We study Hölder regularity for minimizers of functionals having more than quadratic growth and discontinuous coefficients. Starting with the well-known results by Giaquinta, Giusti and Modica , the direct approach was introduced. Later the study made by Giaquinta and Giusti and through the work of many authors, among others Huang, *Daněčcek* and Viszus was developed a theory of partial regularity of solutions of minimizers of variational integrals in vector valued case, using the direct method.

High order differentiability properties of the composition operator in Sobolev Morrey spaces

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Abstract

We prove sufficent conditions on a map f from the real line to itself in order that the composite map $f \circ g$ belongs to a Sobolev Morrey space of real valued functions on a domain of the n-dimensional space for all functions g in such a space. Then we prove sufficient conditions on f in order that the composition operator T_f defined by $T_f[g] \equiv f \circ g$ for all functions g in the Sobolev Morrey space is continuous, Lipschitz continuous, differentiable with all orders and real analytic by applying an abstract scheme. We confine the attention to Sobolev Morrey spaces of order up to one.

Keywords

Composition operator, Morrey space, Sobolev Morrey space

Fractional differential and integral operators Properties and some applications

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Abstract

In this talk, we aim to discus some related works on fractional operators. After that we study extended fractional differential operators (such as the Riemann-Liouville and Caputo type fractional operators) involving hypergeometric function introduced by Srivastava et al. and their properties. Moreover, we as well, study certain fractional integral inequalities associated with the well known PólyaSzegö and Chebyshev type integral inequalities.

Keywords

Riemann-Liouville fractional differential operator, Caputo fractional differential operator, PólyaSzegö type integral inequalities, Chebyshev type integral inequalities.

Totally bounded sets in nonstandard function spaces

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Abstract

We shall discuss the characterization of relatively compact subsets of the variable Lebesgue space on metric measure spaces. Moreover, the characterization of totally bounded sets in general Banach Function Spaces and quasi-Lebesgue space with variable exponent will be presented. (Joint work with Rovshan Bandaliyev, Anna Macios and Humberto Rafeiro.)

Complex interpolation theorem on B^u_w spaces

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Abstract

B^u_w spaces are the hybrid-version of Local morrey-type spaces $LM_{p\theta,w}$, initiated by V. Burenkov and Huseyn V. Guliyev (Studia Math 2004), and B_σ spaces, defined Y. Komori-Furuya, K. Matsuoka, E. Nakai and Y. Sawano (Rev. Mat. Complut. 2013). A real interpolation theorem on the familiy of these spaces was given by E. Nakai and the author(Tokyo J, 2017). In this talk, we consider complex interpolation theorems on this family. The main theorem of this talk was given by Professor Y. Sawano's school, especially Mr. Denny I. Hakim.

Contributed Talks

Generalized fractional integral operators on Morrey type spaces

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Abstract

In this talk, we study the continuity properties of the generalized fractional integral operator I_ρ on the generalized local Morrey spaces $LM_{p,\varphi_1}^{\{x_0\}}$ and generalized Morrey spaces $M_{p,\varphi^{\frac{1}{p}}}$, including weak estimates. Firstly, we proved the Spanne type boundedness of I_ρ from the space $LM_{p,\varphi_1}^{\{x_0\}}$ to another $LM_{q,\varphi_2}^{\{x_0\}}$ for $1 < p < q < \infty$ and from $LM_{1,\varphi_1}^{\{x_0\}}$ to the weak space $WLM_{q,\varphi_2}^{\{x_0\}}$ for $p = 1$ and $1 < q < \infty$. Secondly, we proved the Adams type boundedness of M_ρ from the space $M_{p,\varphi^{\frac{1}{p}}}$ to another $M_{q,\varphi^{\frac{1}{q}}}$ for $1 < p < q < \infty$ and from $M_{1,\varphi}$ to the weak space $WM_{q,\varphi^{\frac{1}{q}}}$ for $p = 1$ and $1 < q < \infty$. In all cases the conditions for the boundedness of I_ρ are given in terms of supremal-type integral inequalities on $(\varphi_1, \varphi_2, \rho)$ and (φ, ρ), which do not assume any assumption on monotonicity of $\varphi_1(x, r)$, $\varphi_2(x, r)$ and $\varphi(x, r)$ in r.

Furthermore, we prove the Spanne type boundedness of the generalized fractional integral operator I_ρ from the vanishing generalized local Morrey spaces $VLM_{p,\varphi_1}^{\{x_0\}}$ to $VLM_{q,\varphi_2}^{\{x_0\}}$, $1 < p < q < \infty$, and from the space $VLM_{1,\varphi_1}^{\{x_0\}}$ to the weak space $VWLM_{q,\varphi_2}^{\{x_0\}}$, $1 < q < \infty$. We also prove the Adams type boundedness of the operator I_ρ from the vanishing generalized Morrey spaces $VM_{p,\varphi^{\frac{1}{p}}}$ to $VM_{q,\varphi^{\frac{1}{q}}}$, $1 < p < q < \infty$ and from the space $VM_{1,\varphi}$ to the weak space $VWM_{q,\varphi^{\frac{1}{q}}}$, $1 < q < \infty$.

Keywords

Generalized fractional integral operator, generalized Morrey space, generalized local Morrey space

Commutators of Marcinkiewicz integral on generalized weighted Morrey spaces

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Abstract

In this abstract we study the boundedness of the commutators of Marcinkiewicz operators $\mu_{b,\Omega}$ on generalized weighted Morrey spaces $M_{p,\varphi}(w)$. We find the sufficient conditions on the pair (φ_1, φ_2) with $b \in BMO(\mathbb{R}^n)$ and $w \in A_p(\mathbb{R}^n)$ which ensures the boundedness of the operators $\mu_{\Omega,b}$ from $M_{p,\varphi_1}(w)$ to $M_{p,\varphi_2}(w)$ for $1 < p < \infty$. In all cases the conditions for the boundedness of the operator μ_Ω is given in terms of Zygmund-type integral inequalities on (φ_1, φ_2) and w, which do not assume any assumption on monotonicity of $\varphi_1(x, r)$, $\varphi_2(x, r)$ in r, see [1].

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Keywords

Commutators of Marcinkiewicz integral, generalized weighted Morrey space

Fractional oscillatory integral operators and their commutators on generalized Orlicz-Morrey spaces of the third kind

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Abstract

We deal with the generalized Orlicz-Morrey space $M_{\Phi,\varphi}$ of the third kind and consider the boundedness of the oscillatory integral operators and fractional oscillatory integral operators on $M_{\Phi,\varphi}$. Some integral estimates for generalized Orlicz-Morrey spaces of the third kind are also obtained by using the weighted Hardy operators. The corresponding commutators generated by BMO functions are also considered.

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Keywords

Generalized Orlicz-Morrey space; oscillatory integral; commutator; BMO spaces.

On the summability by means of matrix transformations

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Abstract

Bor has proved a theorem concerning $| \bar{N}, p_n |_k$ summability factors of infinite series. In this paper, we have established a theorem by generalizing this known theorem with the definition of new summability method. This new theorem also contains several results.

Keywords

Summability factors, absolute matrix summability, matrix transformation, almost increasing sequences, infinite series, Hölder inequality, Minkowski inequality

L-homology theory of FSQL-manifolds and the degree of FSQL-mappings

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Abstract

A homology theory of Banach manifolds of a special form, called FSQL-manifolds, is developed, and also a homological degree of FSQL-mappings between FSQL-manifolds is introduced.

Boundedness of the vector-valued maximal operator on generalized Morrey spaces

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Abstract

In this abstract our aim is to extend the Fefferman-Stein vector-valued inequality to generalized Morrey spaces $M_{p,\varphi}(\mathbb{R}^n)$ for the maximal operator M;

$$\left\| \left(\sum_{j=1}^{\infty} Mf_j{}^q \right)^{\frac{1}{q}} \right\|_{L_p(\mathbb{R}^n)} \lesssim \left\| \left(\sum_{j=1}^{\infty} |f_j|^q \right)^{\frac{1}{q}} \right\|_{L_p(\mathbb{R}^n)}, \tag{1}$$

where $1 < p < \infty$ and $1 < q \leq \infty$; see [1] for the proof of (1). When $q = \infty$, it is understood that (1) reads;

$$\left\| \sup_{j\in\mathbb{N}} Mf_j \right\|_{L_p(\mathbb{R}^n)} \lesssim \left\| \sup_{j\in\mathbb{N}} |f_j| \right\|_{L_p(\mathbb{R}^n)}.$$

Our main result here is as follows, see [2]:

Theorem. *Let $1 \leq q \leq \infty$ and suppose that the couple (φ_1, φ_2) satisfies the condition;*

$$\int_t^{\infty} \left(\inf_{\tau<s<\infty} \phi_1(x,s) s^{\frac{n}{p}} \right) \frac{d\tau}{\tau^{\frac{n}{p}+1}} \lesssim \phi_2(x,t), \tag{2}$$

where the implicit constant does not depend on x and t.

(1) *For $1 < p < \infty$, M is bounded from $M_{p,\phi_1}(l_q, L_p(\mathbb{R}^n))$ to $M_{p,\phi_2}(l_q, L_p(\mathbb{R}^n))$, i.e.,*

$$\left\| \left(\sum_{j=1}^{\infty} Mf_j{}^q \right)^{\frac{1}{q}} \right\|_{M_{p,\varphi_2}(\mathbb{R}^n)} \lesssim \left\| \left(\sum_{j=1}^{\infty} |f_j|^q \right)^{\frac{1}{q}} \right\|_{M_{p,\varphi_1}(\mathbb{R}^n)},$$

holds for all $\{f_j\}_{j=-\infty}^{\infty} \in M_{p,\varphi_1}(l_q, L_p(\mathbb{R}^n))$.

(2) *For $1 \leq p < \infty$, M is bounded from $M_{p,\varphi_1}(l_q, L_p(\mathbb{R}^n))$ to $WM_{p,\varphi_2}(l_q, L_p(\mathbb{R}^n))$, i.e.,*

$$\left\| \left(\sum_{j=1}^{\infty} Mf_j{}^q \right)^{\frac{1}{q}} \right\|_{WM_{p,\varphi_2}(\mathbb{R}^n)} \lesssim \left\| \left(\sum_{j=1}^{\infty} |f_j|^q \right)^{\frac{1}{q}} \right\|_{M_{p,\varphi_1}(\mathbb{R}^n)},$$

holds for all $\{f_j\}_{j=-\infty}^{\infty} \in M_{1,\varphi_1}(l_q, L_p(\mathbb{R}^n))$.

Keywords

Vector-valued generalized Morrey spaces; maximal operator

Acknowledgement

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Approximation of functions by Mellin m -singular integrals at characteristic points

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Abstract

Let $f(r) \in L^p(0,\infty)$ and $K_\lambda(r) \in L^p(0,\infty)$. Then the expression

$$A_\lambda^{[m]}(f:r) = \int_0^\infty \left[\sum_{k=1}^{n} (-1)^{k-1} \binom{m}{k} f\left(\frac{r}{\rho^k}\right)\right] K_\lambda(\rho)\frac{d\rho}{\rho}$$

is said to be ($m \geq 1$) Mellin's m- singular integral, where the kernel $K_\lambda(\rho)$ satisfies the condition

$$\int_0^\infty K_\lambda(\rho)\frac{d\rho}{\rho} = 1,\ K_\lambda(\rho) = K_\lambda(\rho^{-1}).$$

Teorem *Let $f(r) \in L^p(0,\infty)$ and the non-negative kernel $K_\lambda(\rho)$ satisfies the condition*

1^0. The function $K_\lambda(\rho)$ in the interval $(1,\infty)$ monotonically decrease.

2^0. $\nu_\lambda = \int_1^{1+b} |\ln\rho|\, K_\lambda(\rho)\frac{d\rho}{\rho} \to 0$ as $\lambda \to \lambda_0$, where $h > 0_x$ and $b > 0$ are some numbers.

3^0. For any $h > 0$

$$K_\lambda(1+h) = 0\left(\nu_\lambda^{\alpha/n}\right)$$

$$\int_{1+h}^\infty K_\lambda(\rho)\frac{d\rho}{\rho} = 0\left(\nu_\lambda^{\alpha/n}\right)$$

as $\lambda \to \lambda_0$ and $0 < \alpha \leq n$ If at the point r the condition

$$\int_{1+h}^\infty |\varphi_m(f;r,\rho)|^p \frac{d\rho}{\rho} = 0\left(|\ln(1+h)|^{\alpha+1}\right)$$

is fulfilled, then at this point

$$\left|A_\lambda^{[m]}(f;r) - f(r)\right| = 0\left(\nu_\lambda^{\alpha/np}\right)$$

is valid as $\lambda \to \lambda_0$.

$$\left(\varphi_m(f;r,\rho = \left[\Delta_\rho^m + \Delta_{\rho-1}^m\right] f(r)\right).$$

On the growth of the algebraic polynomials on whole complex plane with respect to norm of Lebesgue space

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Abstract

Let $\mathbb{C}$ be a complex plane $\bar{\mathbb{C}} := \mathbb{C} \cup \{\infty\}$; $L := \partial G$ be a Jordan curve, $G := intL$ and $\Omega := extL$. Denote by $w = \Phi(z)$ the univalent conformal mapping of Ω onto $\Delta := \{w : |w| > 1\}$ with normalization $\Phi(\infty) = \infty$, $\lim_{z\to\infty} \frac{\Phi(z)}{z} > 0$ and $\Psi := \Phi^{-1}$.

Let $\{\xi_j\}_{j=1}^m$ be a fixed system of distinct points on curve L located in the positive direction. For some $z \in G_1$, such that $G \Subset G_1$, consider a so-called generalized Jacobi weight function $h(z)$ being defined as follows:

$$h(z) := \prod_{j=1}^{m} |z - \xi_j|^{\gamma_j},$$

where $\gamma_j > -1$ for all $j = 1, 2, ..., m$.

For a rectifiable Jordan curve L and for $0 < p \le \infty$, let $\mathcal{L}_p(h, L)$ denote the weighted Lebesgue space of complex-valued functions on L. Specifically, $f \in \mathcal{L}_p(h, L)$ if f is measurable and the following quasinorm (a norm for $1 \le p \le \infty$ and a $p-$norm for $0 < p < 1$) is finite:

$$\begin{aligned} \|f\|_{\mathcal{L}_p(h,L)} &:= \left(\int_L h(z) |f(z)|^p |dz| \right)^{1/p}, \ 0 < p < \infty; \\ \|f\|_{\mathcal{L}_\infty(1,L)} &:= ess \sup_{z\in L} |f(z)|, \ p = \infty. \end{aligned}$$

We consider the following problem: For a given rectifiable Jordan curve L and weight function $h(z)$ find the numbers $\alpha_n = \alpha_n(L, h, p) > 0$ and $\beta_n = \beta_n(L, h, p) > 0$ such that for any $P_n \in \wp_n$, $n \in \mathbb{N}$, and constant $c = c(L, h, p) > 0$ will fulfilled:

$$|P_n(z)| \le c \|P_n\|_{\mathcal{L}_p(h,L)} \begin{cases} \alpha_n, & z \in \overline{G}, \\ \frac{\beta_n}{F(d)} |\Phi(z)|^{n+1}, & z \in \Omega, \end{cases}$$

where $F(t)$ monotone increasing function, $F(0) = 0$, and $d := dist(z, L) := \inf \{|\zeta - z| : \zeta \in L\}$.

In this work, we study this problem for regions with piecewise-smooth boundary with interior and exterior zero angles.

Keywords

Polynomial Inequalities, Conformal mapping, Smooth curve.

On properties of functions in the grand Sobolev-Morrey spaces

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Abstract

In the abstract we introduce and investigate, from the point of view of embedding theory, certain properties of functions from the grand Sobolev-Morrey spaces $W^{l}_{p),a,\varkappa}(G)$. The norm in a space defines as

$$\|f\|_{W^{l}_{p),a,\varkappa}(G)} = \|f\|_{p),a,\varkappa;G} + \sum_{i=1}^{n} \|D_i^{l_i} f\|_{p),a,\varkappa;G},$$

$$\|f\|_{p),a,\varkappa;G} = \sup_{\substack{x\in G \\ t>0 \\ 0<\varepsilon<p-1}} \left([t]_1^{-|\varkappa|a} \frac{\varepsilon}{|G_{t^{\varkappa}}(x)|} \int\limits_{G_{t^{\varkappa}}} |f(y)|^{p-\varepsilon} dy \right)^{\frac{1}{p-\varepsilon}},$$

where $G \in R^n, l \in N^n, 1 < p < \infty, a \in [0,1]$, $\varkappa \in (0,\infty)^n$, $[t]_1 = \min\{1, t\}$.

Embedding theorems of the type

1. $D^{\nu} : W^{l}_{p),a,\varkappa}(G) \hookrightarrow L_{q-\varepsilon}(G)$ $(p \le q \le \infty)$ and $D^{\nu} : W^{l}_{p),a,\varkappa}(G) \hookrightarrow L_{q),b,\varkappa}(G)$ $(p \le q < \infty)$
2. $D^{\nu} : W^{l}_{p),a,\varkappa}(G) \hookrightarrow W^{l^1}_{q-\varepsilon}(G)$ is holds;
3. it is also proved that for the function from space $f \in W^{l}_{p),a,\varkappa}(G)$, the generalized derivatives $D^{\nu} f$ satisfy the Hölder condition in the metric $L_q(G)$ or $C(G)$. It should be noted that here the Hölder exponent is greater than in the case when $f \in W^{l}_{p,a,\varkappa}(G)$.

Keywords

grand Sobolev-Morrey spaces, embedding theorem, generalized derivatives.

The embedding theorems of space $S^l_{p,\varphi,\beta}W(G)$

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Abstract

In the abstract we introduce a Sobolev-Morrey spaces $S^l_{p,\varphi,\beta}W(G)$ with dominant mixed derivatives and studied differential properties of function from this spaces.

A space of the form $S^l_{p,\varphi,\beta}W(G)$ is defined as

$$\|f\|_{S^l_{p,\varphi,\beta}W(G)}=\sum_{e\subseteq e_n}\left\|D^{l^e}f\right\|_{p,\varphi,\beta;G},$$

where

$$\|f\|_{L_{p,\varphi,\beta}(G)}=\|f\|_{p,\varphi,\beta;G}=\sup_{\substack{x\in G,\\ t_j>0}}\left(|\varphi(t)|_1^{-\beta}\|f\|_{p,G_{\varphi}(x)}\right),$$

$$G_{\varphi(t)}(x)=G\cap I_{\varphi(t)}(x)=G\cap\left\{y:|y_j-x_j|<\frac{1}{2}\varphi_j(t_j),(j\in e_n)\right\}$$

here $G\subset R^n$; $e_n=\{1,2,\ldots,n\}$,$e\subseteq e_n$, $1\leq p<\infty$; $l=(l_1,...,l_n)$, $j_j>0$ are integers,$l^e=(l^e_1,\ldots,l^e_n)$, $l^e_j=l_j>0$ for $j\in e$; $l^e_j=0$ for $j\in e_n\setminus e=e'$; $\varphi(t)=(\varphi_1(t),\ldots,\varphi_n(t_n))$, $\varphi_j(t_j)>0,(t>0)$-is a Lebesgue measurable functions; $\lim\limits_{t_j\to+0}\varphi_j(t_j)=0$, and $\lim\limits_{t_j\to+\infty}\varphi_j(t_j)=\infty$, $\lim\limits_{t\to+0}\varphi_j(t)=0$, $\lim\limits_{t\to+\infty}\varphi_j(t)=\infty$, $|\varphi([t]_1)|^{-\beta}=\prod\limits_{j=1}^{n}\varphi_j([t]_1)^{-\beta_j}$, $[t]_1=\min\{1,t\}$. This spaces, in the case $\varphi_j(t_j)=t_j$, $\beta_j=\frac{\varkappa_j a_j}{p}$ $(j\in e_n)$ coincides with the space $S^l_{p,a,\varkappa}W(G)$ studied in [1], and in the case $\beta_j=0$ $(j\in e_n)$ coincides with the space $S^l_pW(G)$ studied in [2].

To this end, integral representations of functions from $S^l_{p,\varphi,\beta}W(G)$ space, define on n-dimension domains satisfy the flexible φ-horn condition. By this integral representations embedding theorems of the type

1. $D^\nu:S^l_{p,\varphi,\beta}W(G)\hookrightarrow L_{q,\psi,\beta_1}(G)$ $(C(G))$
2. $D^\nu:S^l_{p,\varphi,\beta}W(G)\hookrightarrow S^{l^1}_{q,\psi,\beta_1}W(G)$ $(l^0\in N^n)$ is holds;

3. it is also proved that for the function from space $S^{l}_{p,\varphi,\beta}W\,(G)$ the generalized derivatives $D^{\nu}f$ satisfy the Hölder condition in the metric $L_q(G)$ and $C(G)$.

Keywords

Sobolev-Morrey spaces, embedding theorem, dominant mixed derivatives.

Reference

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Fractional multilinear integrals with rough kernels on generalized weighted Morrey spaces

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(Joint work with Ali Akbulut)

Abstract

In this abstract we study the boundedness of fractional multilinear integral operators with rough kernels $T_{\Omega,\alpha}^{A_1,A_2,\ldots,A_k}$, which is generalization of the higher-order commutator of the rough fractional integral on the generalized weighted Morrey spaces $M_{p,\varphi}(w)$. We find the sufficient conditions on the pair (φ_1,φ_2) with $w \in A_{p,q}$ which ensures the boundedness of the operators $T_{\Omega,\alpha}^{A_1,A_2,\ldots,A_k}$ from $M_{p,\varphi_1}(w^p)$ to $M_{p,\varphi_2}(w^q)$ for $1 < p < q < \infty$. In all cases the conditions for the boundedness of the operator $T_{\Omega,\alpha}^{A_1,A_2,\ldots,A_k}$ is given in terms of Zygmund-type integral inequalities on (φ_1,φ_2) and w, which do not assume any assumption on monotonicity of $\varphi_1(x,r)$, $\varphi_2(x,r)$ in r, see [1].

[1] Ali Akbulut, Amil Hasanov, *Fractional multilinear integrals with rough kernels on generalized weighted Morrey spaces*, Open Mathematics, 2016; 14: 1023-1038.

Keywords

fractional multilinear integral; rough kernel; BMO; generalized weighted Morrey space

Mixed Morrey estimates for singular integral operators and their applications

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Abstract

Aim of this work is to show the boundedness of some singular integral operators in the framework of Mixed Morrey spaces, defined in [2]. As a consequence of these estimates, we present regularity results for solutions to partial differential equations of parabolic type.

Let $1 < p, q < +\infty$, $0 < \lambda, \mu < n$. Let us define the set $L^{q,\mu}(0,T,L^{p,\lambda}(\Omega))$ as the class of functions f such that the following norm is finite:

$$\|f\|_{L^{q,\mu}(0,T,L^{p,\lambda}(\Omega))} := \left(\sup_{\substack{t_0, t\in(0,T)\\ \rho>0}} \frac{1}{\rho^{\mu}} \int\limits_{(0,T)\cap(t_0-\rho,t_0+\rho)} \left(\sup_{\substack{x\in\Omega\\ \rho>0}} \frac{1}{\rho^{\lambda}} \int\limits_{\Omega\cap B_\rho(x)} |f(y,t)|^p \,\mathrm{d}y \right)^{\frac{q}{p}} \mathrm{d}t \right)^{\frac{1}{q}},$$

with obvious modifications if $\Omega = \mathbb{R}^n$.

In [2] the authors show the boundedness of the Riesz potential, convolution singular integral operator $T = K * f$, where k is a Calderón-Zygmund kernel, and commutators.

Precisely it is proved the boundedness in $L^{q,\mu}(0,T,L^{p,\lambda}(\mathbb{R}^n))$ of these operators:

$$Kf(x) = P.V. \int\limits_{\mathbb{R}^n} k(x, x-y) f(y)\,\mathrm{d}y, \quad C[a,f](x) = P.V. \int\limits_{\mathbb{R}^n} k(x, x-y)[a(x)-a(y)] f(y)\,\mathrm{d}y,$$

where $k(x,y)$ is a variable Calderón-Zygmund kernel for a.e. $x \in \mathbb{R}^{n+1}$, $f \in L^{q,\mu}(0,T,L^{p,\lambda}(\mathbb{R}^n))$ with $1 < p, q < \infty$, $0 < \lambda, \mu < n$, $a \in BMO(\mathbb{R}^{n+1})$.

For similar recent results in the framework of generalized local Morrey spaces, we refer the reader to [1].

These estimates seem to be of independent interest but they are also very useful tools in the study of regularity properties of solutions to partial differential equations.

Let $n \geq 3$, $Q_T = \Omega' \times (0,T)$ be a cylinder of $\mathbb{R}^{n+1}$ of base $\Omega' \subset \mathbb{R}^n$. Let us set $x = (x', t) = (x'_1, x_2, \ldots, x'_n, t)$ a generic point in Q_T, $f \in L^{q,\mu}(0,T,L^{p,\lambda}(\Omega'))$, $1 < p, q < \infty$, $0 < \lambda, \mu < n$ and let us consider the following nondivergence form parabolic equation:

$$\mathcal{L}\, u \equiv u_t - \sum_{i,j=1}^{n} a_{ij}(x',t) \frac{\partial^2 u}{\partial x'_i \partial x'_j} = f(x',t).$$

We emphasize that the coefficients a_{ij} belong to the Sarason class VMO of functions having vanishing mean oscillation. This fact allows us to consider also discontinuous coefficients. Using the representation formula for the second order spatial derivatives of u and applying the results stated above, we derive interior estimates on $L^{q,\mu}(0,T,L^{p,\lambda})$ for $D_{x_i' x_j'} u$ and u_t.

Mixed Morrey Spaces, BMO, VMO, Singular integral operators, Partial Differential Equations

Reference

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https://doi.org/10.1016/j.jmaa.2016.09.070.

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https://doi.org/10.1016/j.na.2016.11.017.

Approximation by Kantrovich operators in Morrey spaces

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Abstract

In this work, we show a pointwise estimate for the n-th Kantrovich operator K_n and apply it to polynomial approximation in Morrey spaces. Polynomial approximation is a branch of approximation theory that has many important applications in various fields of mathematics, including functional analysis, numerical analysis of differential and integral equations. The approximation by Bernstein and Bernstein type polynomials is a very old problem that has various application in many fields. Indeed, Bernstein polynomials are used for a constructive proof of Weierstrass's theorem, which dates back to Sergei Bernstein in 1911 (see [1]), he proposed to use polynomials of the form

$$B_n(f;x) := \sum_{k=0}^{n} f\left(\frac{k}{n}\right)\binom{n}{k} x^k(1-x)^{n-k}; \quad x \in [0,1]$$

He showed that these polynomials converge uniformly over $[0,1]$ to the original function $f \in C[a,b]$. In order to generalize these polynomial operators for approximating the function $f \in L_p([0,1])$, Kantorovich proposed polynomial operators of the form

$$K_n(f,x) := (n+1)\sum_{k=0}^{n} b_{n,k}(x)\int_{\frac{k}{n+1}}^{\frac{k+1}{n+1}} f(t)dt, \tag{3}$$

where $b_{n,k}(x) := \binom{n}{k} x^k(1-x)^{n-k}$; see [1]. Here we aim to consider the convergence of $\{K_n(f,\cdot)\}_{n=1}^{\infty}$ to f in Morrey spaces together with some convergence rate.

This work is based on a joint work with Professors Viktor Burenkov (Peoples' Friendship University of Russian) and Yoshihiro Sawano (Tokyo Metropolitan University).

Keywords

Morrey spaces, Kantrovich operators, Modulus of continuity

Reference

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n-Tuplet Coincidence Point Theorems in Partially Ordered Probabilistic Metric Spaces

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Abstract

In this study, we establish the concept of n-tuplet fixed point theorems for contractive type mappings in partially ordered probabilistic metric spaces.

Keywords

Probabilistic metric spaces, n-tuplet fixed point, Partially ordered set

Parabolic fractional integral operators with rough kernel in parabolic local generalized Morrey spaces

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Abstract

Let $\Omega \in L_s(S^{n-1})$ with $1 < s \leq \infty$ be a A_t homogeneous of degree zero, $M^P_{\Omega,\alpha}$ and $I^P_{\Omega,\alpha}$ be the parabolic fractional maximal and parabolic fractional integral operators with rough kernels, where $0 < \alpha < \gamma$ and $\gamma = \mathrm{tr}P$ is the homogeneous dimension on $\mathbb{R}^n$. We study the continuity properties of $M^P_{\Omega,\alpha}$ and $I^P_{\Omega,\alpha}$ on the parabolic generalized local Morrey spaces $LM^{\{x_0\}}_{p,\varphi,P}$. We find the conditions on the pair (φ_1, φ_2) which ensures the boundedness of the operator $M^P_{\Omega,\alpha}$ from one parabolic generalized Morrey space $LM^{\{x_0\}}_{p,\varphi_1,P}(\mathbb{R}^n)$ to another $LM^{\{x_0\}}_{q,\varphi_2,P}(\mathbb{R}^n)$, $1 < p \leq q < \infty$, $1/p - 1/q = \alpha/\gamma$, and from the space $LM^{\{x_0\}}_{1,\varphi_1,P}(\mathbb{R}^n)$ to the weak space $WLM^{\{x_0\}}_{q,\varphi_2,P}(\mathbb{R}^n)$, $1 \leq q < \infty$, $1 - 1/q = \alpha/\gamma$, see [1].

[1] A. Balakishiyev, Sh.A. Muradova, N.Z. Orucov, *Parabolic fractional integral operators with rough kernels in parabolic local generalized Morrey spaces.* Caspian Journal of Applied Mathematics, Ecology and Economics, 4 (1) 2016, 59-68.

Keywords

parabolic fractional integral operator; rough kernels; parabolic generalized local Morrey space; commutator; parabolic local Campanato space

Poincare type inequality in Besov-Morrey type spaces.

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Abstract

In this abstract we give a conditions for the validity of estimation in the $L_q(G)$ norm of functions

$$D^{\nu}(f(x)-P_{l^0-1}),$$

where

$$f\in\bigcap_{i=1}^{n}\mathcal{L}^{<l^i>}_{p^i,\theta^1,a,\varkappa,\tau}(G).$$

Main object is method the integral representations of functions from Besov-Morrey type spaces defined on n-dimensional domains satisfy the flexible horn condition.

$$\bigcap_{i=0}^{n}\mathcal{L}^{<l^i>}_{p^i,\theta^1,a,\varkappa,\tau}(G).$$

We obtained the inequalities of the type

$$\|D^{\nu}(f-P_{l^0-1})\|_{q,G}\leq C\|f\|_{\bigcap\limits_{i=1}^{n}\mathcal{L}^{<l^i>}_{p^i,\theta^1,a,\varkappa,\tau}(G)}$$

$\nu=(\nu_1,...,\nu_n)$, $\nu_j\geq 0$ be integers $(j=1,2,\ldots,n)$. The spaces $\bigcap\limits_{i=0}^{n}\mathcal{L}^{<l^i>}_{p^i,\theta^1,a,\varkappa,\tau}(G)$ is defined with the finite norm ([1]) $(m^i_j>l^i_j-k^i_j\geq 0;\ (j\neq i=1,2,\ldots,n),m^i_i>l^i_i-k^i_i>0)$,

$$\|f\|_{\bigcap_{i=0}^{n}\mathrm{L}^{<l^i>}_{\mathrm{p^i},\theta^i,a,\varkappa,\tau}(G)}=\sum_{i=0}^{n}\|f\|_{\mathrm{L}^{<l^i>}_{\mathrm{p^i},\theta^i,a,\varkappa,\tau}(G)},$$

$$\|f\|_{\mathrm{L}^{<l^i>}_{\mathrm{p^i},\theta^i,a,\varkappa,\tau}(G)}=\left\{\int_0^{h_0}\left[\frac{\left\|\Delta^{m^i}\left(h^{\lambda};G\right)D^{k^i}f\right\|_{\mathrm{p^i},a,\varkappa,\tau}}{h^{(\lambda,l^i-k^i)}}\right]^{\theta^i}\frac{dh}{h}\right\}^{\frac{1}{\theta^i}},$$

$$\|f\|_{\mathrm{p^i},a,\varkappa,\tau;G}=\|f\|_{L_{\mathrm{p^i},a,\varkappa,\tau}(G)}=\sup_{x\in G}\left\{\int_0^{\infty}\left[[t]_1^{-\frac{(\varkappa,a)}{p^i}}\|f\|_{\mathrm{p^i},G_{t^{\varkappa}}(x)}\right]^{\tau}\frac{dt}{t}\right\}^{\frac{1}{\tau}},$$

where $p^i\in[1,\infty),\theta^i,\tau\in[1,\infty],(i=0,1,...,n);l^i=\left(l^i_1,l^i_2,...,l^i_n\right),l^0_j\geq 0,l^i_j\geq 0,l^i_i>0$; $a\in[0,1]$, $\varkappa\in(0,\infty)^n,m^i\in N^n,k^i\in N^n_0,[t]_1=\min\{1,t\}$. Note that the space $\bigcap\limits_{i=0}^{n}\mathcal{L}^{<l^i>}_{p^i,\theta^1,a,\varkappa,\tau}(G)$ in the case $l^0=(0,0,...,0,)\,l^i=(0,0,...,0,l_i,0,...,0)$, $\theta^i=\theta$, $p^i=p(i=1,2,...,n)$ coincides with $B^{l}_{p,\theta,a,\chi,\tau}(G,\lambda)$ spaces.

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Keywords

Besov-Morrey spaces, estimates of L_q norm of functions, integral representations

On approximation theorem for two-dimensional Szasz type operator in Lebesgue spaces

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Abstract

In this abstract is reduce the approximation theorems for two-dimensional Szasz operator in Lebesgue spaces.

Let $R_+^2 = \left\{(x,y) \in R^2 : \ x \geq 0, y \geq 0\right\}$ and let $f : R_+^2 \to R$. We consider the two-dimensional Szasz type operator defined as

$$W_{n,m}(f;x,y) = n\,m\,e^{-nx}e^{-my}\sum_{k,l=0}^{\infty}\left[\int_{\frac{k}{n}}^{\frac{k+1}{n}}\int_{\frac{l}{m}}^{\frac{l+1}{m}} f(s,\tau)\,dsd\tau\right]\frac{(nx)^k}{k!}\frac{(my)^l}{l!}.$$

Let $f \in L_1^{loc}\left(R_+^2\right)$ and we denote

$$\theta(x,y;f) = \sup_{\substack{0<s,\tau<\infty \\ (x,y)\neq(s,\tau)}}\int_x^s\int_y^\tau |f(z,t)|\,dz\,dt.$$

Now we introduce the following theorem.

Theorem. *Let $1 < p < \infty$ and $f \in L_p\left(R_+^2\right)$. Then for the operator $W_{n,m}(f;x,y)$ the following statements is hold:*

1) $W_{n,m}(f;x,y) \to f(x,y)$, $n,m \to \infty$ a.e. $(x,y) \in R_+^2$;

2) there exists an element $\theta(x,y;f) \in L_p\left(R_+^2\right)$ such that

$$\sup_{(n,m)\in R_+^2}|W_{n,m}(f;x,y)| \leq 81\,\theta(x,y;f)$$

a.e. $(x,y) \in R_+^2$.

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Keywords

Approximation theorem; Lebesgue spaces; two-dimensional Szasz type operator

Existence of a pair of new recurrence relations for the Meixner-Pollaczek polynomials

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Abstract

Orthogonal polynomials play important role in the explicit solution of huge number of problems coming from physics and mathematics. Their advantage is that by emploing number of known properties of them (three-term recurrence relations, differential/difference equations. forward/backward shift operators, generating functions etc), one can construct number of exactly-solvable dynamical systems with various behaviour of the eigenvalues and eigenfunctions. Maeixner-Pollaczek polynomials are one of them. These polynomials are introduced in [1] and then, have been used for explicit solution of quantum systems related with quantum harmonic oscillator models [2, 3]. It is necessary to note that, these polynomials are related with Meixner polynomials via simple transformation [4], which are in the discrete configurational space as important as Meixner-Pollaczek polynomials [5, 6, 7].

Meixner-Pollaczek polynomials are defined through the $2F1$ hypergeometric functions by the following expression:

$$P_n^{(\lambda)}(x;\phi) = \frac{(2\lambda)_n}{n!} e^{in\phi}\, {}_2F_1\left(\begin{matrix} -n, \lambda + ix \\ 2\lambda \end{matrix} ;\ 1 - e^{-2i\phi} \right).$$

They satisfy the following orthogonality relation in the continuous configurational space:

$$\frac{1}{2\pi} \int_{-\infty}^{\infty} e^{(2\phi-\pi)x} \left|\Gamma(\lambda + ix)\right|^2 P_m^{(\lambda)}(x;\phi)\, P_n^{(\lambda)}(x;\phi)\, dx = \frac{\Gamma(n+2\lambda)}{(2\sin\phi)^{2\lambda}\, n!}\delta_{mn}, \quad \lambda > 0, \quad 0 < \phi < \pi.$$

We report on existence of pair of recurrence relations for these polynomials of the following kind:

$$2\left(x-i\lambda\right)\sin\phi\cdot P_n^{(\lambda+\frac{1}{2})}\left(x-\tfrac{i}{2};\phi\right)=\left(n+1\right)P_{n+1}^{(\lambda)}\left(x;\phi\right)-e^{i\phi}\left(n+2\lambda\right)P_n^{(\lambda)}\left(x;\phi\right),$$

$$P_n^{(\lambda)}\left(x;\phi\right)=P_n^{(\lambda+\frac{1}{2})}\left(x-\tfrac{i}{2};\phi\right)-e^{-i\phi}P_{n-1}^{(\lambda+\frac{1}{2})}\left(x-\tfrac{i}{2};\phi\right),$$

which are of unknown up today and they completely differ from known three-term recurrence relation

$$2\left[x\sin\phi+\left(n+\lambda\right)\cos\phi\right]P_n^{(\lambda)}\left(x;\phi\right)=\left(n+1\right)P_{n+1}^{(\lambda)}\left(x;\phi\right)+\left(n+2\lambda-1\right)P_{n-1}^{(\lambda)}\left(x;\phi\right),$$

as well as from the following known forward and backward shift operators for this polynomials:

$$\left(e^{i\phi}-e^{-i\phi}\right)P_{n-1}^{(\lambda)}\left(x;\phi\right)=P_n^{(\lambda)}\left(x+\tfrac{i}{2};\phi\right)-P_n^{(\lambda)}\left(x-\tfrac{i}{2};\phi\right),$$
$$\left(n+1\right)P_{n+1}^{(\lambda-\frac{1}{2})}\left(x;\phi\right)=e^{i\phi}\left(\lambda-\tfrac{1}{2}-ix\right)P_n^{(\lambda)}\left(x+\tfrac{i}{2};\phi\right)+e^{i\phi}\left(\lambda-\tfrac{1}{2}+ix\right)P_n^{(\lambda)}\left(x-\tfrac{i}{2};\phi\right).$$

Correctness of reported pair of the recurrence relations can be easily proven by using known properties of the shifted factorials and $2F1$ hypergeometric functions.

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Keywords

Meixner-Pollaczek polynomials, Finite-difference equation, Recurrence relations

Global regularity in Orlicz-Morrey spaces of solutions to nondivergence elliptic equations with VMO coefficients

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Abstract

We show continuity in generalized Orlicz-Morrey spaces $M^{\Phi,\varphi}(\mathbb{R}^n)$ of sublinear integral operators generated by Calderón-Zygmund operator and their commutators with BMO functions. The obtained estimates are used to study global regularity of the solution of the Dirichlet problem for linear uniformly elliptic operator $\mathcal{L} = \sum_{i,j=1}^{n} a^{ij}(x)D_{ij}$ with discontinuous coefficients. We show that $\mathcal{L}u \in M^{\Phi,\varphi}$ implies the second order derivatives belong to $M^{\Phi,\varphi}$ too.

Keywords

Generalized Orlicz-Morrey spaces; sublinear integrals; Calderón-Zygmund integrals; commutators; VMO; elliptic equations; Dirichlet problem

On asymptotic formula for two-dimensional Bernstein-Chlodowsky type polynomials

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Abstract

In this abstract we establish an asymptotic formula for Bernstein-Chlodowsky type polynomials of two variables on the triangular domain.

Let $\{b_n\}$ be an increasing sequence of positive real numbers and satisfy the condition $\lim\limits_{n\to\infty} b_n = \infty$. Let $R_+^2 = \left\{(x,y) \in R^2 : \ x \geq 0, y \geq 0\right\}$ and $\Delta_{b_n} = \left\{(x,y) \in R_+^2 : \ x+y \leq b_n\right\}$ be the triangular domain. Assume that f is a function defined on R_+^2 and is bounded in every triangular Δ_{b_n} for fixed n and

$$\lim_{n\to\infty} M_n(f)\frac{b_n^2}{n} = 0, \tag{1}$$

where $M_n(f) = \sup\limits_{(t,\tau)\in\Delta_{b_n}} f(t,\tau)$. We consider the Bernstein-Chlodowsky type polynomials of two variables on the triangular domain (see [1])

$$B_n(f;x,y) = \sum_{k=0}^{n} C_n^k \left(1 - \frac{x+y}{b_n}\right)^{n-k} \sum_{i=0}^{k} f\left(\frac{k-i}{n}b_n, \frac{i}{n}b_n\right) C_k^i \left(\frac{x}{b_n}\right)^{k-i} \left(\frac{y}{b_n}\right)^i.$$

Theorem. *Let f is a function defined on R_+^2 and is bounded in every triangular Δ_{b_n} for fixed n and satisfy the condition (1). Assume that at a point $(x,y) \in \Delta_{b_n}$ all second order partial derivatives exists. Then for Bernstein-Chlodowsky type polynomials of two variables the following asymptotic formula is valid:*

$$B_n(f;x,y) = f(x,y) + \frac{x\,(b_n - x)}{2n} f''_{x^2}(x,y) + \frac{y\,(b_n - y)}{2n} f''_{y^2}(x,y) - \frac{xy}{n} f''_{xy}(x,y) + r_n(x,y), n \to \infty,$$

where $\lim\limits_{n\to\infty} r_n(x,y) = 0$.

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Asymptotic formula; two-dimensional Bernstein-Chlodowsky type polynomials; approximation theorem

Some properties of a function spaces of Lizorkin-Triebel-Morrey type with dominant mixed derivatives

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Abstract

In the abstract we introduce a Lizorkin-Triebel-Morrey type spaces $S^l_{p,\theta,\varphi,\beta}F(G)$ with dominant mixed derivatives and studied differential properties of function from this spaces. A space of the norm $S^l_{p,\theta,\varphi,\beta}F(G)$ is defined as

$$\|f\|_{S^l_{p,\theta,\varphi,\beta}F(G)} = \sum_{e\subseteq e_n} \left\| \left\{ \int_{0^e}^{t^e_o} \left[\frac{\delta^{m^e-k^e}(\varphi(t))D^{k^e}f(\cdot)}{\prod_{j\in e}(\varphi_j(t_j))^{l_j-k_j}} \right]^\theta \prod_{j\in e} \frac{d\varphi_j(t_j)}{\varphi_j(t_j)} \right\}^{\frac{1}{\theta}} \right\|_{p,\varphi,\beta}$$

where

$$\|f\|_{p,\varphi,\beta,G} = \|f\|_{L_{p,\varphi,\beta}(G)} = \sup_{\substack{x\in G,\\ t_j.0}} \left(\prod_{j\in e_n} \varphi_j\left([t_j]_1\right)^{\beta_j} \|f\|_{p,G_{\varphi(t)}(x)} \right),$$

$$G_{\varphi(t)}(x) = G \bigcap \left\{ y : |y_j - x_j| < \frac{1}{2}\varphi_j(t_j),\ j\in e_n \right\},$$

here G$\subset R^n$; $e_n = \{1,2,\dots,n\}$; $1<p<\infty$: $l=(l_1,\dots,l_n)$, $l\in(0,\infty)^n$; $l^e=(l^e_1,\dots,l^e_n)$, $l^e_j = l_j$
for $j\in e$; $l^e_j = 0$for $j\in e_n\backslash e$; $\varphi(t)=(\varphi_1(t_1),\dots,\varphi_n(t_n))$, $\varphi_j(t_j)>0$ $(t_j>0,\ j\in e_n)$ is continu-
osly differentiable functions; $\lim\limits_{t_j\to\infty}\varphi_j(t_j)=\infty$ and $\lim\limits_{t_j\to 0}\varphi_j(t_j)=0$; $m_j\in N$, $k_j\in N_0$;

$$[t_j]_1 = \min\{1,t_j\},\ j\in e_n.$$

Note that the space $S^l_{p,\theta,\varphi,\beta}F(G)$ in the case $\varphi_j(t_j)=t_j$, $\beta_j=\frac{\chi_j a_j}{p}$ $(j\in e_n)$ coincides with the space $S^l_{p,\theta,a,\chi}F(G)$, and in case $\beta_j=0$ $(j\in e_n)$ coincides with the space $S^l_{p,\theta}F(G)$.
By the method of integral representations of functions, embedding theorems of the type

$$1.D^\nu : S^l_{p,\theta,\varphi,\beta}F(G) \to L_{q,\psi,\beta_1}(G)\ (C(G))$$

$$2.D^{\nu} : S^{l}_{p,\theta,\varphi,\beta}F(G) \to S^{l^1}_{q,\vartheta_1,\psi,\beta_1}F(G) \ (\theta < \theta_1).$$

3. It is also proved that for function from space $S^{l}_{p,\theta,\varphi,\beta}F(G)$, the generalized derivatives D^{ν} satisfy generalized Holder condition.in the metric $L_q(G)$and $C(G)$.

Keywords

Lizorkin-Triebel-Morrey type spaces, dominant mixed derivatives, integral representations of functions

Some results concerning the summability of infinite series

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Abstract

In the present paper, a theorem which contains a result dealing with absolute summability factors of infinite series has been generalized to absolute matrix summability under weaker conditions by using almost increasing sequences. Also, some results have been deduced.

Keywords

Riesz mean, summability factors, absolute matrix summability, matrix transformation, almost increasing sequences, Hölder inequality, Minkowski inequality

The Fractional-Order Mathematical Modeling of bacterial competition with theraphy of multiple antibiotics

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Abstract

There is always the need to develop various therapeutic strategies to combat many fatal diseases caused by bacteria. Among these therapeutic strategies, the theraphy of special multiple antibiotics against the bacteria that cause disease is the most common one in the world. In general, the bacterial infection is a complex process for not only the infectious bacteria but also the host. This process in experimental studies is very complex because of interactions between the bacteria causing the infections. In this respect, it has led to the need to interpret the process by alternative methods such as statistical analysis of the data and mathematical modeling.

Fractional-order differential equation have been the focus of many studies due to their frequent appearance in various applications in fluid mechanics, economic, viscoelasticity, biology, physics and engineering. Lately, a large amount of literature has been developed concerning the application of fractional differential equations in nonlinear dynamics. In this study, we have constructed time model including Fractional-order differential equation's system considering the basic mechanisms of two species of bacteria competing each others and exposed antibiotics.

We have constructed that bacterial population sizes in an individual receiving a cocktail of multi-drug treatment against bacteria. Bacteria in model have competitive ability against each order for common host. That all bacteria have not resistance ability against to multiple antibiotics has assumed in model. Let us denote by $B_1(t)$ and $B_2(t)$ the population sizes of first, and second bacteria to multiple antibiotics at time t, respectively; and by $A_i(t)$ the concentration of the i-th antibiotic, $i= 1, 2, ...,n$. The parameters used in the model are as follows: We suppose that bacteria follow a logistic growth with different carrying capacity $K_1$and K_2, respectively. Let β_{B_1} and β_{B_2} the birth rate of first and second bacteria, respectively. The first and second bacteria have per capita natural death rates $\mu_{B_1}$and μ_{B_2}, respectively. The first bacteria also die due to the action of the antibiotics, and we assume that the rate at which they are killed by the i-th antibiotic is equal to $\overline{\alpha}_i B_1 A_i$. In the same mind, let denote $\overline{q}_i B_2 A_i$ for other. The mutual competition between the species dictates that M_1, M_2. Finally, the i-th antibiotic concentration is supplied at a constant rate δ_i, and is taken up at a constant per capita rate ω_i.

Under the assumptions a fore mentioned, we acquire the following system of $(n+2)$ ODE's:

$$\begin{aligned} D^{\alpha}B_1 &= \beta_{B_1}B_1\left(1-\tfrac{B_1}{K_1}\right)-[\textstyle\sum_{i=1}^{n}\overline{\alpha_i}A_iB_1]-\mu_{B_1}B_1-M_1B_2B_1 \\ D^{\alpha}B_2 &= \beta_{B_2}B_2\left(1-\tfrac{B_2}{K_2}\right)-[\textstyle\sum_{i=1}^{n}\overline{q_i}A_iB_2]-\mu_{B_2}B_2-M_2B_1B_2 \\ D^{\alpha}A_i &= \delta_i-\omega_iA_i, \qquad\qquad i=1,2,...,n. \end{aligned} \tag{1}$$

with the initial values

$B_1(t)|_{t=0}=B_1(0)$, $B_2(t)|_{t=0}=B_2(0)$ and $A_i(t)|_{t=0}=A_i(0)$ for $i=1,2,...,n$

where $\alpha\in(0,1]$.

Our aim is to obtain certain conditions dependent on the development of the first and second bacteria population under the pressure of multiple antibiotic. Also, the analysis results of model that consistent with datas obtained from experimental studies in literarature have supported by numerical simulations.

Keywords

Fractional-order differential equation system, Mathematical model, Stability analysis, Equilibrium points, Multiple antibiotics

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Mathematical Modeling of Local Bacterial Infection

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Abstract

In this study, we have constructed a continuous time model considering the immune response of the host and the basic mechanisms of bacterial resistance to antibiotics. Let us denote by $S(t)$ and $R(t)$ the population sizes of sensitive and resistant bacteria against multiple antibiotics at time t, respectively, by $B(t)$ population sizes of immune cells at time t, and by $A_i(t)$ the concentration of the i-th antibiotic, for $i= 1, 2, ...,n$ at time t. The parameters used in the model are as follows:

We assume that bacteria follow a logistic growth with carrying capacity T. Let β_S and $(1-c)\beta_S$ the birth rate of sensitive and resistant bacteria, respectively. Likewise, we have supposed that immune cells are recruited to the region of infection at a rate k and proportionally amount of present bacteria. Also, these interacts can be expressed as a generalised model of a local bacterial infection, such as a urinary tract, tuberculosis or wound infection.

During the administration of the i-th antibiotic, a number of resistant bacteria to it can be showed up due to mutations of exposed sensitive bacteria to such antibiotic, we model this situation by the term $\overline{\alpha_i}A_iS$ where $\overline{\alpha_i}$ is the mutation rate of sensitive bacteria due to exposure to i-th antibiotic. Sensitive and resistant bacteria have per capita death rates by response of immune cells and this rates is λ. Sensitive bacteria also die due to the action of the antibiotics, and we have assumed that this situation in model is by the term $\overline{d_i}A_iS$, where $\overline{d_i}$ is the death rate of sensitive bacteria due to exposure to i-th antibiotic. Lastly, the i-th antibiotic concentration is supplied at a constant rate δ_i, and is taken up at a constant per capita rate μ_i. Under the assumptions aforementioned, we obtain the following system of $(n+3)$ ODE's:

$$\begin{aligned}
&\tfrac{dS}{dt} = \beta_S S\left(1-\tfrac{S+R}{T}\right) - \lambda SB - S\textstyle\sum_{i=1}^{n}\overline{\alpha_i}A_i - S\sum_{i=1}^{n}\overline{d_i}A_i\\
&\tfrac{dR}{dt} = (1-c)\beta_S R\left(1-\tfrac{S+R}{T}\right) - \lambda RB + S\textstyle\sum_{i=1}^{n}\overline{\alpha_i}A_i\\
&\tfrac{dB}{dt} = kB(S+R) - HB\\
&\tfrac{dA_i}{dt} = \delta_i - \mu_i A_i,\ i= 1, 2, ...,n.
\end{aligned} \tag{1}$$

where

$$\beta_S, c, \lambda, T, k, H, \overline{\alpha_i}, \overline{d_i}, \delta_i, \mu_i > 0 \text{ for } i= 1, 2, ...n \tag{2}$$

Our aim is to find specific parameters determining the change in the concentrations of the immune system's cells produced in host to fight these and the sensitive sub-populations and resistant sub-populations that has either arisen through random mutation and clonal enlargement or through cross-contamination in a special infection and under a appropriate treatment regimen. In this same way, the system have analysed as qualitative and the results obtained from this analysis are backed up through numerical simulations.

Keywords

Ordinary differential equations systems, Qualitative analysis, Numerical simulation

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Positive solutions of second-order neutral differential equations with distributed deviating arguments

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Abstract

We consider some sufficient conditions for the existence of nonoscillatory solutions of variable coefficient nonlinear second order neutral differential equation with distributed deviating arguments. Our results improve and extend some existing results.We use the Banach contraction principle and fix point to obtain new sufficient conditions for the existence of nonoscillatory solution.

Keywords

Fixed point, Distributed deviating argument, Nonoscillatory

Positive solutions of second-order neutral differential equations with forcing term

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Abstract

We obtain some sufficient conditions for the existence of nonoscillatory solutions of nonlinear second order neutral differential equation with forcing term using Banach contraction principle and fix point. Our results improve and extend some existing results.

Keywords

Fixed point, Second-order, Nonoscillatory solution.

General spectral stability theorem for the eigenvalues of a pair of linear operators

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Abstract

We consider the eigenvalue problem of the form $Hu = \lambda Mu$, where H and M are unbounded non-negative self-adjoint linear operators.

Let $\varphi_{k,1}$ be the eigenvectors of the pair of operators $(H_1,\ M_1)$, $\varphi_{k,2}$ be the eigenvectors of the pair of operators $(H_1,\ M_1)$, $k \in \mathbb{N}$, satisfying the conditions:

$$(M_1\varphi_{k,1}, \varphi_{l,1}) = \delta_{kl} = \begin{cases} 0,\ if\ k \neq l \\ 1,\ if\ k = l \end{cases}; \qquad (M_2\varphi_{k,2r}\varphi_{l,2}) = \delta_{kl}.$$

Definition: Let A_1 and A_2 be two non-empty families of non-empty open sets in $\mathbb{R}^N$, for all $\Omega_1 \in A_1, \Omega_2 \in A_2$: $H_1 = H_1(\Omega_1)$, $M_1 = M_1(\Omega_1)$ and $H_2 = H_2(\Omega_2)$, $M_2 = M_2(\Omega_2)$, where H_1, M_1 and H_2, M_2-be non-negative self-adjoint linear operators on $L^2(\Omega_1)$, $L^2(\Omega_2)$ respectively.

Let $B_1 = \{(H_1(\Omega_1),\ M_1(\Omega_1)) : \Omega_1 \in A_1\}, B_2 = \{(H_2(\Omega_2),\ M_2(\Omega_2)) : \Omega_2 \in A_2\}$;

$\delta : B_1 \times B_2 \to [0, \infty); 0 \leq a_{mn}, b_{mn} < \infty, 0 < \delta'_{mn}, \delta''_{mn} \leq \infty \forall m, n \in \mathbb{N}.$

We say that $T_{12} : \mathcal{L}_1 \to Dom(H_2)$ is an transition operator from $(H_1,\ M_1)$ to $(H_2,\ M_2)$ with the measure of vicinity 6 and parameters $a_{mn}, b_{mn}\delta'_{mn}$ and δ''_{mn}, if it is linear and satisfies the following conditions:

i) $(M_2T_{12}\varphi_{n,1},\ T_{12}\varphi_{n,1})_{L^2(\Omega_2)} \geq 1 - a_{nn}\delta\Big((H_1,\ M_1)\ ,\ (H_2, M_2)\Big), n \in \mathbb{N}$,
if $\delta((H_1,\ M_1),\ (H_2,\ M_2)) < \delta'_{nn}$.

ii) $|(M_2T_{12}\varphi_{m,1},\ T_{12}\varphi_{n,1})_{L^2(\Omega_2)}| \leq a_{mn}\delta\Big((H_1,\ M_1)\ ,\ (H_2, M_2)\Big), n \in \mathbb{N}, m \neq n$,
if $\delta\Big((H_1,\ M_1),\ (H_2,\ M_2)\Big) < \delta'_{mn}$.

iii) $(H_2T_{12}\varphi_{n,1},\ T_{12}\varphi_{n,1})_{L^2(\Omega_2)} \leq \lambda_{n,1} + b_{nn}\delta\Big((H_1,\ M_1)\ ,\ (H_2, M_2)\Big), n \in \mathbb{N}$,
if $\delta((H_1,\ M_1),\ (H_2,\ M_2)) < \delta''_{nn}$.

iii) $|(H_2 T_{12}\varphi_{m,1},\ T_{12}\varphi_{n,1})_{L^2(\Omega_2)}| \le b_{mn}\delta((H_1,\ M_1),\ (H_2,\ M_2)) \quad m,n \in \mathbb{N}, m \ne n,$ if $\delta((H_1,\ M_1),\ (H_2,\ M_2)) < \delta''_{mn}$.

where $\mathcal{L}_1 = \bigcup_{n=1}^{\infty} L_n[(H_1,\ M_1)]$, $L_n[(H_1,\ M_1)]$ is the linear span of the eigenvectors $\varphi_{1,1},\ldots,\ \varphi_{n,1}$, corresponding to the eigenvalues $\lambda_{1,1},\ldots,\ \lambda_{n,1}$ of the pair of operators $(H_1,\ M_1)$.

Theorem: Let A_1, A_2, B_1, B_2 and $\delta : B_1 \times B_2 \to [0,\ \infty)$ be as in Defmition. Then the following statements are equivalent:

(a) for all $n \in \mathbb{N}$ there exist $0 \le c_n < \infty$ and $0 < \varepsilon_n \le \infty$ such that for all pairs of operators $(H_1,\ M_1) \in B_1$ and $(H_2,\ M_2) \in B_2$ satisfying $\delta((H_1,\ M_1),\ (H_2,\ M_2)) < \varepsilon_n$:

$$\lambda_{n,2} \le \lambda_{n,1} + c_n\delta((H_1,\ M_1),\ (H_2,\ M_2)) \qquad (1)$$

(b) for all $m,n \in N$ there exist $0 \le a_{mn}/b_{mn} < \infty, 0 < \delta'_{mn}, \delta''_{mn} \le \infty$ and, for all $(H_1,\ M_1) \in B_1, (H_2,\ M_2) \in B_2$, there exists a transition operator T_{12} from $(H_1,\ M_1)$ to $(H_2,\ M_2)$.

Moreover, if (a) holds, then (1) holds for all $(H_1,\ M_1) \in B_1$, $(H_2,\ M_2) \in B_2$ satisfying $\delta((H_1,\ M_1),\ (H_2,\ M_2)) < \varepsilon_n$, with:

$$c_n = 2(a_n\lambda_{n,1} + b_n); \quad \varepsilon_n = \min\{\delta'_n, \delta''_n, (2a_n)^{-1}\};$$

where $a_n = \left(\sum_{k,l=1}^{n} a_{k,l}^2\right)^{1/2}$, $b_n = \left(\sum_{k,l=1}^{n} b_{k,l}^2\right)^{1/2}$, $\delta'_n = \min_{k,l\le n} \delta'_{k,l}$, $\delta''_n \min_{k,l\le n} \delta''_{k,l}$.

For the case $M_1 = M_2 = I$ this theorem was proved in [1].

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Boundedness of the Fractional Maximal Operator in the Local Morrey-Lorentz Spaces

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Abstract

In this study, we obtain the necessary and sufficient conditions for the boundedness of the fractional maximal operator M_α in the local Morrey- Lorentz spaces $M^{loc}_{p,q;\lambda}(\mathbb{R}^n)$. We use sharp rearrangement inequalities while proving our result. We apply this result to the Schrödinger operator $-\Delta + V$ on $\mathbb{R}^n$, where the nonnegative potential V belongs to the reverse Hölder class $B_\infty(\mathbb{R}^n)$. The local Morrey- Lorentz $M^{loc}_{p,r;\lambda}(\mathbb{R}^n) \to M^{loc}_{q,s;\lambda}(\mathbb{R}^n)$ estimates for the Schrödinger type operators $V^\gamma(-\Delta + V)^{-\beta}$ and $V^\gamma\nabla(-\Delta + V)^{-\beta}$ are obtained.

Keywords

Local Morrey-Lorentz spaces, fractional maximal operator, Schrödinger operator.

Some boundedness of homogeneous B-fractional integrals on $H^p_{\Delta_\nu}$ Hardy spaces

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Abstract

In this paper, we shall study the map properties of the homogeneous fractional integrals related to Bessel generalized shift operator on $H^p_{\Delta_\nu}$ Hardy space. By using the atomic characterization and the $L^q_\nu(1 < q < \infty)$ boundedness for the singular integral operators on the space of homogeneous type, we show that these operators are bounded from $H^p_{\Delta_\nu}$ to $H^q_{\Delta_\nu}$, for $\frac{1}{q} = \frac{1}{p} - \frac{\alpha}{Q}$, provided $0 < \alpha < \frac{1}{2}$, and $\alpha < \beta \leq 1$ and $\frac{Q}{Q+\beta} < p \leq \frac{Q}{Q+\alpha}$. The results are the extensions of Stein-Weiss (for $p = 1$) and Taibleson-Weisss (for $n/(n+\alpha) \leq p < 1$) results on the boundedness of the B-Riesz potential operator $I^\alpha_{\Omega,\nu}$ on the Hardy space $H^p_{\Delta_\nu}$.

Keywords

Atomic-molecular decomposition, Bessel operator, B-Riesz potential operator, Generalized shift operator, Hardy space.

A Novel Chelyshkov Approach Technique for Solving Functional Integro-Differential Equation with Mixed Delays

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Abstract

This document is to present a improved collocation method based on Chelyshkov polynomials to solve the functional integro-differential equations with mixed delays under the initial-boundary conditions. An efficient error estimation for the Chelyshkov collocation method is also introduced. Some examples from quite different fields of pure and applied mathematics are given to demonstrate the validation and application of the method and a comparison is made between obtained and existing results.

Keywords

Delay integro-differential equations; Chelyshkov polynomials; Numerical solutions.

Acknowledgement

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Chelyshkov collocation Approach for Solving Some Population Models

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Abstract

In this work, a collocation method is proposed to obtain the approximate solutions of the population models for single-species and multispecies. By using the Chelyshkov polynomials and collocation points, this method transforms population model into a matrix equation. The matrix equation corresponds to a system of linear or nonlinear equations with the unknown Chelyshkov coefficients. The reliability and efficiency of the proposed scheme are demonstrated by a few numerical examples and performed on the computer algebraic system.

Keywords

Delay differential equations; Chelyshkov polynomials and series; Collocation Method.

Acknowledgement

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On pre-compactness of a set in general local and global Morrey-type spaces

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Abstract

In this paper, we present conditions for the precompactness of a set in general local Morrey type spaces and general global Morrey-type spaces are obtained.

Let $0 < p, \theta \leq \infty$, and let w be a nonnegative measurable function on $(0, \infty)$. We denote by $LM_{p\theta,w(.)}$ the general local Morrey-type space, the space of all functions $f \in L_p^{loc}(R^n)$ p (Rn) with finite quasi-norm:

$$\|f\|_{LM_{p\theta,w(.)}} \equiv \|f\|_{LM_{p\theta,w(.)}(R^n)} = \left\| w(r)\|f\|_{L_p(B(0,R))} \right\|_{L_\theta(0,\infty)}.$$

We denote by Ω_θ the set of all functions that are nonnegative, measurable on $(0, \infty)$, not equivalent 0 and such, that for some $t > 0$, $\|w(r)\|_{L_\theta(t,\infty)} < \infty$.

The space $LM_{p\theta,w(.)}$ is non-trivial, that is, it consists not only of functions, equivalent to 0 on R^n, if and only if $w \in \Omega_\theta$ [BGG].

Let $0 < p, \theta \leq \infty$ and let w be a nonnegative measurable function on $(0, \infty)$. The general global Morrey-type space $GM_{p\theta,w(.)} \equiv GM_{p\theta,w(.)}(\mathbb{R}^n)$ is defined as the set of all functions $f \in L_p^{loc}(\mathbb{R}^n)$ with finite quasi-norm

$$\|f\|_{GM_{p\theta,w(.)}} \equiv \sup_{x\in\mathbb{R}^n} \left\| w(r)\|f\|_{L_pB(x,r)} \right\|_{L_\theta(0,\infty)}.$$

We denote by $\Omega_{p\theta}$ the set of all functions that are nonnegative, measurable on $(0, \infty)$, not equivalent to 0 and such, that for some $t > 0$ (and therefore for all $t > 0$), $\|w(r)r^{\frac{n}{p}}\|_{L_\theta(0,t)} < \infty$. The space $GM_{p\theta,w(.)}$ is non-trivial, that is, it consists not only of functions equivalent to 0 in Rn if and only if $w \in \Omega_{p\theta}$

Theorem 1 *Let* $1 < p < \infty, 0 < \theta < \infty, w \in \Omega_\theta$ *and let* $t^{-\frac{n}{p}} \left\| w(r)r^{\frac{n}{p}} \right\|_{L_\theta(0,t)} \leq c_1 \|w(r)\|_{L_\theta(t,\infty)}$.

In order that the set $S \subset LM_{p\theta,w(.)}$ *be precompact in* $LM_{p\theta,w(.)}$ *it is necessary and sufficient that*

$$\sup_{f\in S} \|f\|_{LM_{p\theta,w(.)}} < \infty, \tag{4}$$

$$\lim_{R_1\to 0^+} \sup_{f\in S} \left\| f\chi_{B(0,R_1)} \right\|_{LM_{p\theta,w(.)}} = 0, \tag{5}$$

$$\lim_{\delta\to 0^+} \sup_{f\in S} \left\| A_\delta f - f \|_{L_p(B(0,R_2)\setminus B(0,R_1))} = 0 \right. \tag{6}$$

and

$$\lim_{R_2\to 0^+} \sup_{f\in S} \left\| f\chi_{c_{B(0,R_2)}} \right\|_{LM_{p\theta,w(.)}} = 0. \tag{7}$$

If $\theta = \infty$*, then conditions (1)- (4) are sufficient for the precompactness of the set* $S \subset LM_{p\theta,w(.)}$*. If* $1 < p < \infty, 0 < \theta < \infty$*,* $w \in \Omega_{p\theta}$ *then the set of conditions (1), (2), (4) in which the space* $LM_{p\theta,w(.)}$ *is replaced by* $GM_{p\theta,w(.)}$ *and the condition (3) is sufficient for the precompactness of the set* $S \subset GM_{p\theta,w(.)}$*.*

Keywords

Morrey space, precompactness, compactness, local and global Morrey-type spaces.

F-contraction of generalized multivalued integral type mappings with α-admissible

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Abstract

The purpose of this paper is to apply F-contraction on generalized multivalued integral type α-ϕ contraction mappings which is multivalued α-admissible. We will also establish fixed point theorem for this mapping in complete metric space. Moreover, we give an application of our result.

Keywords

Multivalued mapping and fixed point, Integral Type, F- contraction

On Marcinkiewicz-type interpolation theorem for Morrey-type spaces

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Abstract

We introduce a class of Morrey-type spaces $M^{\lambda}_{p,q}$, which includes classical Morrey spaces and discuss their properties. We prove a Marcinkiewicz-type interpolation theorem. This theorem can be efficiently applied to obtaining the boundedness in the introduced Morrey-type spaces of the Riesz potential and singular integral operators.

Let $0 < p \leq \infty$ and $0 \leq \lambda \leq \frac{n}{p}$. The Morrey spaces M^{λ}_{p} were defined as the spaces of all functions $f \in L^{loc}_{p}(\mathbb{R}^n)$ such that

$$||f||_{M^{\lambda}_{p}} \equiv ||f||_{M^{\lambda}_{p}(\mathbb{R}^n)} = \sup_{x\in\mathbb{R}^n} \sup_{t>0} t^{-\lambda} \|f\|_{L_p(B_t(x))} < \infty,$$

where $B_t(x)$ is the open ball of radius $t > 0$ with center at the point $x \in \mathbb{R}^n$.

Classical Morrey spaces and their generalizations have been widely used in many areas of function theory and in the theory of partial differential equations [1]. In the last two decades there was a great interest in studying general Morrey-type spaces and classical operators of theory of functions acting in such spaces. See [2]

Question on the interpolation of these spaces was considered in [3,4,5]. From the results of [5], it follows that

$$(M^{\lambda_0}_{p}, M^{\lambda_1}_{p})_{\theta,\infty} \subset M^{\lambda}_{p},$$

where $1 \leq p < \infty,\ \lambda = (1-\theta)\lambda_0 + \theta\lambda_1,\ 0 < \theta < 1$. In Ruiz and Vega [6], it is proved that this inclusion is strict, which raised the problem of giving a complete description of the interpolation of spaces M^{λ}_{p}. The problem of describing the interpolation space $(M^{\lambda_0}_{p}, M^{\lambda_1}_{p})_{\theta,\infty}$ is still open.

Let $\Omega \subset \mathbb{R}^n,\ 0 < p < \infty,\ 0 < q \leq \infty$ and $0 \leq \lambda \leq \frac{n}{p}$. We introduce the generalized Morrey-type spaces $M^{\lambda}_{p,q}(\Omega)$ that are defined for $q < \infty$ as the spaces of all functions $f \in L^{loc}_p(\mathbb{R}^n)$ such that

$$||f||_{M^{\lambda}_{p,q}(\Omega)} = \left(\int_0^{\infty} \left(t^{-\lambda} \sup_{x \in \Omega} \|f\|_{L_p(B_t(x))} \right)^q \frac{dt}{t} \right)^{\frac{1}{q}} < \infty,$$

and for $q = \infty$,

$$||f||_{M^{\lambda}_{p,\infty}(\Omega)} = \sup_{x \in \Omega} \sup_{t>0} t^{-\lambda} \|f\|_{L_p(B_t(x))} < \infty.$$

Note that the introduced spaces coincide with the classical Morrey spaces in the case of $q = \infty$ and $\Omega = \mathbb{R}^n$, i.e.

$$M^{\lambda}_{p,\infty}(\mathbb{R}^n) = M^{\lambda}_p.$$

If $\Omega = \{x\}$ is a singleton, then

$$M^{\lambda}_{p,q}(\Omega) = LM^{\lambda}_{p,q,x},$$

where $LM^{\lambda}_{p,q,x}$ are local Morrey-type spaces [7].

An analogue of interpolation Marcinkiewicz theorem for spaces $M^{\lambda}_{p,q}(\Omega)$ is proved [8].

Theorem. *Let* $\Omega \subset \mathbb{R}^n,\ 0 < \alpha_0, \alpha_1, \beta_0, \beta_1 < \infty,\ \alpha_0 \neq \alpha_1,\ \beta_0 \neq \beta_1,\ 0 < p, q \leq \infty,$ $0 < \sigma \leq \tau \leq \infty,\ 0 < \theta < 1$ *and*

$$\alpha = (1-\theta)\alpha_0 + \theta\alpha_1,\ \beta = (1-\theta)\beta_0 + \theta\beta_1.$$

Let T *be a quasi-additive operator given on* $LM^{\beta_0}_{q,\sigma,x} + LM^{\beta_1}_{q,\sigma,x},\ x \in \Omega$. *Suppose that for some* $M_1, M_2 > 0$ *the following inequalities hold*

$$\|Tf\|_{LM^{\alpha_i}_{p,\infty,x}} \leq M_i \|f\|_{LM^{\beta_i}_{q,\sigma,x}},\quad x \in \Omega,\ f \in LM^{\beta_i}_{q,\sigma,x},\ i = 0, 1, \tag{8}$$

then

$$\|Tf\|_{M^{\alpha}_{p,\tau}(\Omega)} \leq cAM_0^{1-\theta} M_1^{\theta} \|f\|_{M^{\beta}_{q,\tau}(\Omega)}$$

for all functions $f \in M^{\beta}_{q,\tau}(\Omega)$, *where* $c > 0$ *depends only on* $\alpha_0, \alpha_1, \beta_0, \beta_1, p, q, \sigma, \theta$.

In [8] this theorem was applied to investigating the boundedness of some classical operators in Morrey-type spaces. In particular, estimates for the norms of the Riesz potential and singular operators in the Morrey-type spaces were obtained.

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Keywords

Morrey-type spaces, interpolation theorem, Riesz potential, singular integral operator

Approximation Properties of Generalized Bernstein Operators

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Abstract

In this abstract we consider analog of Bernstein operator given by some sequence converges to infinity. For the generalized Bernstein polynomial Bernstein type approximation theorems is proved for derivative of given function (see [1]).

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Keywords

Generalized Bernstein operator; approximation theorem; Bernstein-Chlodowsky polynomials

On the growth of the algebraic polynomials on whole complex plane with respect to norm of Bergman space

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Abstract

Let $G \subset \mathbb{C}$ be a bounded Jordan region $\mathbb{C}; \bar{\mathcal{C}} \cup \{\infty\}, \Omega := \bar{\mathcal{C}} \backslash \bar{G}; W = \Phi(z)$ be the univalent conformal mapping of Ω onto the $\{w : |w| > 1\}$ normalized by $\Phi(\infty) = \infty$, $\lim_{s \to \partial} \frac{\Phi(z)}{z} > 0$. Let $\wp_n$ denote the class of arbitrary algebraic polynomials $P_n(z)$ of degree at most $n \in \mathbb{N}$. Let h (z) be a weight function. For any $p > 0$ we introduce:

$$\|P_n\|_{A_p(h,G)} := \left(\iint_G h(z) \, |P_n(z)|^p \, dxdy \right)^{1/p} < \infty, \ z = x + iy.$$

In the literature often estimated $|P_n(z)|$ on $\overline{G}$ through its various norms on G. On the other hand, well known Bernstein-Walsh Lemma says that for all $z \in \Omega$ the following estimations is hold:

$$|P_n(z)| \leq |\Phi(z)|^n \, \|P_n\|_{C(\overline{G})},$$

We consider the following problem: For a given region G and weight function $h(z)$ find the numbers $\alpha_n = \alpha_n(G, h, p) > 0$ and $\beta_n = \beta_n(G, h, p) > 0$ such that for any $P_n \in \wp, n \in \mathbb{N}$, and constant $c = c(G; h; p) > 0$ will fulfilled:

$$|P_n(z)| \leq c \, \|P_n\|_{A_p(h,G)} \begin{cases} \alpha_n, & z \in \overline{G}, \\ \frac{\beta_n}{F(d)} \, |\Phi(z)|^{n+1}, & z \in \Omega, \end{cases}$$

where $F(t)$ monotone increasing function, $F(0) = 0$, and $d := dist(z, L) := \inf \{|\zeta - z| : \ \zeta \in L\}$.

In this work, we study this problem for regions with piecewise-smooth boundary with interior zero angles and without exterior zero angles.

Keywords

Polynomial Inequalities, Conformal mapping, Smooth curve.

B-potential operator with the Lorentz distance and its inverse

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Abstract

We deal with the Riesz potential with the Lorentz distance connected with the generalized translation operator. The boundedness of this operator in suitable spaces was proved and the inverse operator was constructed.

Keywords

Riesz potential with Lorentz distance, Bessel operator, fractional integral

We consider Riesz potential with Lorentz distance connected with the generalized translation operator in the following form

$$(I^{\alpha}_{\square_\gamma} f)(x) = \int\limits_{K^+} r^{\frac{\alpha-n-|\gamma|}{2}}(y)(T^y f)(x) y^\gamma dy, \quad y^\gamma = \prod_{i=1}^{n} y_i^{\gamma_i}, \tag{1}$$

where $\alpha > 0$, $n = 2, 3, 4, ...$, $|\gamma| = \gamma_1 + \ldots + \gamma_n$, $r(x) = \sqrt{x_1^2 - x_2^2 - ... - x_n^2}$ is the Lorentz distance, $\gamma = (\gamma_1, \ldots, \gamma_n)$, $\gamma_i > 0$, $i = 1, ..., n$, and $K^+ = \{y \in \mathbb{R}^n : y_1^2 \geq y_2^2 + ... + y_n^2,\ y_1 > 0, ..., y_n > 0\}$, T^y is the generalized multidimensional translation is determined by the formula $(T^y f)(x) = T^{y_1}_{x_1} ... T^{y_n}_{x_n} f(x)$, where

$$(T^{y_i}_{x_i} f)(x) = \frac{\Gamma\left(\frac{\gamma_i+1}{2}\right)}{\Gamma\left(\frac{\gamma_i}{2}\right)\Gamma\left(\frac{1}{2}\right)} \times$$

$$\times \int\limits_0^{\pi} f(x_1, ..., x_{i-1}, \sqrt{x_i^2 + y_i^2 - 2x_i y_i \cos\varphi_i}, x_{i+1}, ..., x_n)\ \sin^{\gamma_i - 1}\varphi_i \, d\varphi_i.$$

For the operator (1) the boundedness was proved and the inverse operator was constructed.

The author is grateful to Prof. Vagif S. Guliev for his kind providing of articles [1] and [2] using which it was possible to complete the construction of the inverse operator to (1). The results about the boundedness of (1) could be found in [3].

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The Hardy-Littlewood-Sobolev theorem for Riesz potential generated by Gegenbauer operator

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Abstract

The Hardy-Littlewood maximal function is an important tool of harmonic analysis. It was first introduced by Hardy and Littlewood in 1930 (see [1]) for $2\pi-$ periodical functions, and later it was extended to the Euclidean spaces, some weighted measure spaces, symmetric spaces, various Lie groups, for the Jacobi-type hypergroups [2], for Chebli-Trimeche hypergroups [3], for the one-dimensional Bessel-Kingman hypergroups [4], for the $n-$ dimensional Bessel-Kingman hypergroups ($n \geq 1$) [5], for Laguerre hypergroup [6]. In [7] introduced and studied the maximal function (G-maximal function) and the Riesz potential (G-Riesz potential) generated by Gegenbauer differential operator

$$G_\lambda = \left(x^2-1\right)^{\frac{1}{2}-\lambda} \frac{d}{dx} \left(x^2-1\right)^{\lambda+\frac{1}{2}} \frac{d}{dx}.$$

The $L_{p,\lambda}$ boundedness of the G- maximal operator is obtained. Hardy-Littlewood-Sobolev theorem of G- Riesz potential on $L_{p,\lambda}$ spaces is established (see [7]).

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Keywords

Riesz potential, Generated by Gegenbauer operator

Parabolic fractional maximal operator with rough kernels in parabolic local generalized Morrey spaces

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Abstract

Let P be a real $n \times n$ matrix, whose all the eigenvalues have positive real part, $A_t = t^P$, $t > 0$, $\gamma = \mathrm{tr}P$ is the homogeneous dimension on $\mathbb{R}^n$ and Ω is an A_t-homogeneous of degree zero function, integrable to a power $s > 1$ on the unit sphere generated by the corresponding parabolic metric. We study the parabolic fractional maximal operator $M^P_{\Omega,\alpha}$, $0 \leq \alpha < \gamma$ with rough kernels in the parabolic local generalized Morrey space $LM^{\{x_0\}}_{p,\varphi,P}(\mathbb{R}^n)$. We find conditions on the pair (φ_1, φ_2) for the boundedness of the operator $I^P_{\Omega,\alpha}$ from the space $LM^{\{x_0\}}_{p,\varphi_1,P}(\mathbb{R}^n)$ to another one $LM^{\{x_0\}}_{q,\varphi_2,P}(\mathbb{R}^n)$, $1 < p < q < \infty$, $1/p - 1/q = \alpha/\gamma$, and from the space $LM^{\{x_0\}}_{1,\varphi_1,P}(\mathbb{R}^n)$ to the weak space $WLM^{\{x_0\}}_{q,\varphi_2,P}(\mathbb{R}^n)$, $1 \leq q < \infty$, $1 - 1/q = \alpha/\gamma$, see [1].

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Keywords

Parabolic fractional maximal function, parabolic local generalized Morrey space

On Existence and Convergence Theorems for A New Multivalued Mapping in Geodesic Spaces

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Abstract

In this presentation, we introduced a new multivalued mapping in geodesic spaces and proved some existence and convergence theorems. We also study on stability of this class of mappings

Keywords
Fixed point, New iteration, Geodesic space

Global exponential stability of BAM neural networks with varying delays and impulses

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Abstract

We have obtained sufficient conditions for the existence and global exponential stability of a unique equilibrium of a class of two-layer heteroassociative networks which is referred to as bidirectional associative memory (BAM) networks with Lipschitzian activation functions. We presented such conditions without supposing their boundedness, monotonicity or differentiability and subjected to impulsive state displacements at fixed instants of time.

Keywords

Exponential stability, neural networks, delayed differential equations

Global asymptotic stability of a certain integro-differential systems modeling neural networks with delays

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Abstract

In this study, we give sufficient conditions for the global asymptotic stability of the equilibrium point of a certain integro-differential systems modeling neural networks with time-varying delays. Proper Lyapunov functionals and some analytic techniques are employed to derive the sufficient conditions under which the networks proposed are the global asymptotic stability. The results have shown to improve the previous global asymptotic stability results derived in the literature.

Keywords

Global asymtotic stability, neural networks, delayed differential equations

On the behavior of the algebraic polynomials in regions with cusps

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Abstract

Let $G \subset \mathbb{C}$ be a bounded Jordan region. Let $\wp_n$ denote the class of arbitrary algebraic polynomials $P_n(z)$ of degree at most $n \in \mathbb{N}$. Let $h(z)$ be a weight function. For any $p > 0$ we introduce:

$$\|P_n\|_{A_p(h,G)} := \left(\iint_G h(z) \, |P_n(z)|^p \, dxdy \right)^{1/p} < \infty, \ z = x + iy.$$

We consider the following problem: For a given region G and weight function $h(z)$ find the number $\alpha_n = \alpha_n(G,h) > 0$ such that for any $P_n \in \wp_n$, $n \in \mathbb{N}$, and constant $c = c(G,h,p) > 0$ will fulfilled:

$$|P_n(z)| \leq c\alpha_n \, \|P_n\|_{A_p(h,G)}, \ z \in \overline{G}.$$

In this work, we study this problem for some regions having interior zero angles.

Keywords

Polynomial Inequalities, Conformal mapping, Quasiconformal curve.

Numerical reckoning coincidence points of a new general class of nonself operators via a simpler and faster iterative scheme

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Abstract

We continue to study analytical and numerical treatment of Jungck-type iterative schemes through a newly introduced general class of nonself operators to get an insight in the corresponding results obtained in [Appl. Math. Comput. 231, 521-535 (2014)], [Int. J. Comput. Math. 93(12), 2092-2105 (2016)], [Turk J. Math. 40(3), 631-640, (2016)]. Our results correspond to a substantial improvement over the results in the above mentioned references as well as many others in the current literature. Some illustrative examples are also given to validate the theoretical results obtained herein.

Keywords

Convergency, Data dependency, Jungck-type iterative schemes

B-maximal operator on B-Orlicz spaces

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Abstract

The Hardy-Littlewood maximal function is an important tool of harmonic analysis. It was first introduced by Hardy and Littlewood in 1930 (see [1]) for $2\pi-$ periodical functions, and later it was extended to the Euclidean spaces, for the one-dimensional Bessel-Kingman hypergroups [2], for the $n-$ dimensional Bessel-Kingman hypergroups ($n \geq 1$) [3].

Orlicz spaces, introduced in [4], are generalizations of Lebesgue spaces L_p. They are useful tools in harmonic analysis and its applications. For example, the Hardy-Littlewood maximal operator is bounded on L_p for $1 < p < \infty$, but not on L_1. Using Orlicz spaces, we can investigate the boundedness of the maximal operator near $p = 1$ more precisely (see [5, 6]).

In this talk studied the boundedness of maximal operator, generated by Bessel differential operator (B-maximal operator)

$$B = \frac{d^2}{dx^2} + \frac{\gamma}{x}\frac{d}{dx}$$

on B-Orlicz spaces $L_{\Phi,\gamma}(0,\infty)$. The $L_{\Phi,\gamma}(0,\infty)$ boundedness of the B-maximal operator is obtained.

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Keywords

B-maximal function, Bessel differential operator

Characterizations for the maximal operator on generalized weighted Orlicz-Morrey spaces

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Abstract

In this talk, we shall give necessary and sufficient conditions for the boundedness of the Hardy-Littlewood maximal operator on generalized weighted Orlicz-Morrey spaces. The main advance in comparison with the existing results is that we manage to obtain conditions for the boundedness not in integral terms but in less restrictive terms of supremal operators and we do not need Δ_2-condition for the boundedness of the maximal operator.

Keywords

generalized weighted Orlicz-Morrey space; maximal operator

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Maximal function associated with a homogeneous function

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Abstract

In this talk, we focus on a maximal function associated with homogeneous functions $\Omega : \mathbb{R}^m \to \mathbb{R}$ of degree $\alpha > 0$, i.e. $\Omega(ry) = r^\alpha \Omega(y)$ for $r > 0$ and obtain the norm inequalities for the maximal function associated with homogeneous functions on Lebesgue spaces. We show continuity in the Lebesgue spaces $L^p(\mathbb{R}^n)$, $1 < p \leq \infty$ of the maximal function associated with homogeneous functions.

Keywords

Maximal function; homogeneous function

The solvalibity and qualitative property of boundary value problems for nonlinear degenerate elliptic equations.

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Abstract

In present work we is considering of boundary value problem for nonlinear degenerate elliptic equations. Firstly we is proving of solvability Dirichlet problem for these equations. Also we is study the qualitative property of solutions.

Keywords

solvability, nonlinear equation,qualitative

Nonlinear singular integral operators depending on two parameters from another point of view

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Abstract

In this study, we prove some theorems on weighted pointwise convergence of nonlinear singular integral operators depending on two parameters. Our main aim is to present the conditions under which the convolution type nonlinear singular integral operators approximate to the identity operator at some characteristic points of locally integrable functions in weighted sense.

Keywords

nonlinear integral operator, pointwise convergence, rate of pointwise convergence

More on singular integral operators of multivariables

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Abstract

In this study, we present some new results on weighted pointwise convergence of singular integral operators of multivariables. First, we define a new class of kernel functions and the properties of weight function will be used in it. Then, we will present the main results.

Keywords

integral operator, pointwise convergence, rate of pointwise convergence

Perfectly Optimally Clean Rings

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Abstract

In this note we continue to study and investigate further properties of optimally J-clean rings defined in [2] generalizing optimally clean rings defined in [3]. Perfectly J-clean rings and perfectly clean notions for rings defined and studied in [1]. We combine these two notions and introduce perfectly optimally clean rings and perfectly optimally J-clean rings. For an integral domain D, $M_2(D)$ is strongly J-clean if and only if it is perfectly J-clean. For a local ring S, $T_2(S)$ is strongly J-clean if and only if it is optimally J-clean. A ring R is perfectly J-clean if and only if R is perfectly clean and $R/J(R)$ is Boolean.

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Keywords

Perfectly J-clean rings, optimally J-clean rings, quasipolar rings

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Some New Pascal Sequence Spaces

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Abstract

The main purpose of the present paper is to study of some new Pascal sequence spaces p_∞, p_c and p_0. New Pascal sequence spaces p_1, p_c and $p_0$are BK-spaces including the spaces l_∞, c and c_0 and prove that the spaces p_∞, p_c and p_0 are linearly isomorphic to the spaces $l\infty$, c and c_0 respectively. Afterward, $\alpha-, \beta$- and γ-duals of these spaces p_c and p_0 are computed and their bases are constructed. Finally, matrix the classes $(p_c : l_p)$ and $(p_c : c)$ have been characterized.

Keywords

Pascal sequence spaces; $\alpha-, \beta$- and γ-duals and basis of sequence; matrix mappings.

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Implementation of entropy theory for Burgers' equation

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Abstract

This work presents a review of entropy theory, which is an active research field, for Burgers'equation. The employment of comparison principle has been the main tool for this theory. This principle is used to develop entropy stable semi-discrete numerical schemes. In this context, we delved into different kinds of entropy and corresponding entropy flux functions while deriving entropy stable schemes for the governing problem.

Keywords

finite difference, Burgers' equation, entropy stability

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On upward half Cauchy sequences

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Abstract

In this paper, we introduce and investigate the concept of up continuity, where a real valued function f defined on a subset A of $\mathbb{R}$ is up continuous if it preserves upward half Cauchy sequences of points in A, i.e. $(f(x_n))$ is upward half Cauchy whenever (x_n) is an upward half Cauchy sequence of points of A. It turns out that the set of up continuous functions is a proper subset of the set of continuous functions.

Keywords

Sequences; series; summability; continuity

Reference

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Necessary and suffcient conditions for the boundedness of fractional maximal operator in local Morrey-type spaces

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(Joint work with V.I. Burenkov and V.S. Guliyev)

Abstract

The main purpose of this talk is to give some necessary and sufficient conditions for the boundedness of fractional maximal operators in Morrey-type spaces. The boundedness of the fractional maximal operator M_α $(0 < \alpha < n)$, in local and global Morrey-type spaces, was reduce to the problem of boundedness of the Hardy operator in weighted L_p-spaces on the cone of non-negative non-increasing functions. Then the authors obtain sharp sufficient conditions for the boundedness for all admissible values of the parameters. Moreover, in the case of local Morrey-type spaces, for some values of parameters, these sufficient conditions coincide with the necessary ones, see [1,2].

Reference

[1] V.I. Burenkov, V.S. Guliev, H.V. Guliev, *Necessary and sufficient conditions for the boundedness of the fractional maximal operator in local Morrey-type spaces*, (Russian) Dokl. Akad. Nauk 409 (2006), no. 4, 443-447.

[2] V.I. Burenkov, V.S. Guliev, H.V. Guliev, *Necessary and sufficient conditions for the boundedness of fractional maximal operators in local Morrey-type spaces*, J. Comput. Appl. Math. 208 (2007), no. 1, 280-301.

Keywords

Fractional maximal operator, Hardy operator, local Morrey-type spaces.

Potential operators in modified Morrey spaces defined on Carleson curves

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Abstract

In this abstract we study the potential operator I_Γ^α, $0 < \alpha < 1$ in the modified Morrey space $\widetilde{L}_{p,\lambda}(\Gamma)$ defined on Carleson curves Γ. We prove that for $1 < p < (1-\lambda)/\alpha$ the potential operator I_Γ^α is bounded from the modified Morrey space $\widetilde{L}_{p,\lambda}(\Gamma)$ to $\widetilde{L}_{q,\lambda}(\Gamma)$ if and in the case of infinite curve only if $\alpha \le 1/p - 1/q \le \alpha/(1-\lambda)$, and from the spaces $\widetilde{L}_{1,\lambda}(\Gamma)$ to $W\widetilde{L}_{q,\lambda}(\Gamma)$ if and in the case of infinite curve only if $\alpha \le 1 - 1/q \le \alpha/(1-\lambda)$, see [1].

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Keywords

Carleson curve; modified Morrey space; potential operator.

On the well-posed solvability of the Neumann problem for a generalized Mangeron equation with nonsmooth coefficients

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Abstract

In this abstract for a generalized Mangeron equation with nonsmooth coefficients, we consider the Neumann problem with nonclassical conditions that do not require matching conditions. We justify the equivalence of these conditions to classical boundary conditions for the case in which the solution of the problem is sought in an isotropic Sobolev space. The problem is solved by reduction to a system of Fredholm equations whose well-posed solvability is proved under nonsmooth conditions on the coefficients of the equation by the integral representation method (see, for example [1,2]).

[1] I. G. Mamedov, *Neumann problem in the non-classical treatment for a pseudoparabolic equation,* IV International Conference "Problems of Cybernetics and Informatics" (PCI'2012), 149-151.

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Keywords

Neumann problem; Sobolev space; integral representation method; generalized Mangeron equation; equations with nonsmooth coefficients; system of Fredholm equations

The boundedness of generalized fractional integral operators on some function spaces

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Abstract

In my master degree in this poster presentation whose topic is The boundedness of generalized fractional integral operators on some function spaces I present the specification and the description about Generalized fractional integral operators and boundedness of Generalized Morrey Spaces

Keywords

Generalized fractional integral operators, Generalized Morrey spaces

Reference

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Various Generalizations of Fixed Point Results in b-Metric Spaces

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Abstract

In this presentation, we consider some remarks on .xed point results and Picard sequence for the single-valued mappings in the framework of b-metric spaces. Our results extend and complement some theorems given in the literature.

Keywords

Fixed point; b-metric space; Picard sequence

Thin Sets in Weighted Variable Exponent Sobolev Spaces

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Abstract

In this study, we discuss some properties of weighted Sobolev capacity and relative $p(.)$-capacity in the weighted variable exponent Sobolev spaces. Moreover, we define thin sets and fine topology in these spaces.

Keywords

Weighted variable exponent Sobolev spaces, relative capacity,
Sobolev capacity, thinness.

On Some Properties of a Banach Algebra

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Abstract

Let G be a locally compact Abelian group. The main purpose of this study is to show that $\mathbf{A}_{p_1,p_2}^{q_1,q_2}(G) \cap L^1(G)$ is a abstract Segal algebra by using amalgam spaces. Furthermore, we investigate ideals, embeddings and multipliers of this space.

Keywords

Amalgam spaces, abstract Segal algebra, embeddings, multipliers.

On the Boundedness of Singular Integrals in Lebesgue Spaces with Variable Exponent

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Abstract

It is well known that Caldern-Zygmund operators are bounded for $1 < p < \infty$ in L_p Lebesgue spaces. But this operators are unbounded for $0 < p < 1$ in L_p Lebesgue spaces. Thus, when studying the boundedness of singular integral operators with convolution kernel, the Hardy spaces $H_p(\mathbb{R}^n)$ with $p \in (0, 1]$ are good substitutes of $L_p(\mathbb{R}^n)$, for example, the classical Riesz transforms are bounded on $H_p(\mathbb{R}^n)$ with $p \in (0, 1]$ but not on $L_p(\mathbb{R}^n)$. We proved that the boundedness of these Riesz-Bessel transforms in Hardy spaces. But, some problems arise in showing the boundedness of these transformations in variable exponent Hardy spaces. Hence, we need some steps to characterize the boundedness of these Riesz-Bessel transforms in variable Hardy spaces. Therefore, when considering the boundedness of Riesz-Bessel transforms in variable exponent Hardy spaces, the problem of the boundedness of singular integral operator in variable exponent Lebesgue spaces have arisen. To prove it, we have need the boundedness of singular integral operators with convolution type, taking into account the generalized translation operator developed by Levitan. To work this, there are stages which first one the boundedness of generalized shift operator in variable exponent Lebesgue spaces. In this study, this problem will be considered.

Keywords

Generalized Shift operator, Maximal functions, Singular integral operator, variable exponents Lebesgue spaces

Characterizations for the fractional integral operators in generalized Morrey spaces on Carnot groups

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Abstract

We study the boundedness of the fractional integral operator I_α on Carnot group $\mathcal{G}$ in the generalized Morrey spaces $M_{p,\varphi}(\mathcal{G})$. We shall give a characterization for the Spanne-Guliyev, Adams-Guliyev and Adams-Gunawan strong and weak type boundedness of I_α on the generalized Morrey spaces, respectively.

As applications of the properties of the fundamental solution of sub-Laplacian $\mathcal{L}$ on $\mathcal{G}$, we prove two Sobolev-Stein embedding theorems on generalized Morrey spaces in the Carnot group setting, see [1].

[1] A. Eroglu, V. S. Guliyev, J.V. Azizov, *Characterizations for the fractional integral operators in generalized Morrey spaces on Carnot groups*, submitted.

Keywords

Generalized Morrey spaces; fractional integral; Carnot group

Maximal and singular integral operators on generalized weighted Morrey spaces with variable exponent

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Abstract

We consider the generalized weighted Morrey spaces $\mathcal{M}_{\omega}^{p(\cdot),\varphi}(\Omega)$, $\omega \in A_{p(\cdot)}(\Omega)$ with variable exponent $p(x)$ and a general function $\varphi(x,r)$ defining the Morrey-type norm. In case of unbounded sets $\Omega \subset \mathbb{R}^n$ we prove the boundedness of the Hardy-Littlewood maximal operator and Calderon-Zygmund singular operators with standard kernel, in such spaces.

Keywords

Maximal operator, singular integral operators, generalized weighted Morrey space with variable exponen

A study on a faster Mann iterative method

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Abstract

In this presentation, we introduced a faster Mann-type iterative method than Mann iterative method that showed strong convergence to fixed point for almost contraction mappings in Banach spaces. Also, we prove that the strong convergences of them are equal. Finally, we show that the Mann-type iterative process is faster than the classical Mann iterative process.

Keywords

Mann-type iterative scheme; Almost contraction mappings; Rate of convergence

Q-Analysis and The Fractional Integral Operator in Q-Analysis

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Abstract

In my master degree in this poster presentation whose topic is q-analysis and The fractional integral operator in q-analysis I present the specification and the description of q-analysis the fractional integral operator in q-analysis.

Keywords
Q-Analysis Q-Integral

Reference

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Characterizations for the parabolic fractional integral operators in parabolic generalized Morrey spaces

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Abstract

We study the boundedness of the parabolic fractional integral operator I_α^P in the parabolic generalized Morrey spaces $M_{p,\varphi,P}(\mathbb{R}^n)$. We shall give a characterization for the Spanne-Guliyev, Adams-Guliyev and Adams-Gunawan strong and weak type boundedness of I_α^P on the parabolic generalized Morrey spaces, respectively, see [1].

[1] V.S. Guliyev, K. Rahimova, *Characterizations of parabolic fractional integral operators on generalized parabolic Morrey spaces*, Trans. Natl. Acad. Sci. Azerb. Ser. Phys.-Tech. Math. Sci. 36 (4) (2016), 156-166.

Necessary and sufficient conditions for the boundedness of comutators of B-Riesz potentials in Lebegues spaces

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Abstract

In this paper the authors obtain necessary and sufficient conditions for the boundedness of the commutator $[b, I_\gamma^\alpha]$ defined by

$$[b, I_\gamma^\alpha] f(x) = \int_{\mathbb{R}^n_{k,+}} [b(x) - b(y)] f(y) T^y |x|^{\alpha - n - |\gamma|} (y')^\gamma dy$$

in the $L_{p,\gamma}$ spaces, where $0 < \alpha < n + |\gamma|$ and b is a locally integrable function on $\mathbb{R}^n_{k,+}$. It is proved that the commutator $[b, I_\gamma^\alpha]$ is bounded from the spaces $L_{p,\gamma}(\mathbb{R}^n_{k,+})$ to $L_{q,\gamma}(\mathbb{R}^n_{k,+})$, $1 < p < \frac{n+|\gamma|}{\alpha}$, $\frac{1}{p} - \frac{1}{q} = \frac{\alpha}{n+|\gamma|}$, and from the spaces $L_{1,\gamma}(\mathbb{R}^n_{k,+})$ to $WL_{q,\gamma}(\mathbb{R}^n_{k,+})$, $p = 1$, $1 - \frac{1}{q} = \frac{\alpha}{n+|\gamma|}$ if and only if $b \in BMO_\gamma(\mathbb{R}^n_{k,+})$. Furthermore, it is shown that If $1 < p = \frac{n+|\gamma|}{\alpha}$, then the commutator $[b, \widetilde{I}_\gamma^\alpha]$ formed by the modified $B-$Riesz potential

$$\widetilde{I}_\gamma^\alpha f(x) = \int_{\mathbb{R}^n_{k,+}} \left(T^y |x|^{\alpha - n - |\gamma|} - |y|^{\alpha - n - |\gamma|} \chi_{\{|y|>1\}}(y) \right) f(y) (y')^\gamma dy,$$

is bounded from $L_{p,\gamma}\left(\mathbb{R}^n_{k,+}\right)$ to $BMO_\gamma\left(\mathbb{R}^n_{k,+}\right)$.

Keywords

Commutator, generalized shift operator, B-Riesz potential, BMO_γ space.

Inverse Spectral Problem for Energy-Dependent Integro-Differential Operator with point $\delta-$Interaction

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Abstract

Spectral problems of differential operators have been studied in two main directions: direct and inverse problems. Direct problems of spectral analysis is devoted to investigation of the spectral properties of an operator. On the other hand, inverse problems aim at recovering operators from their spectral characteristics. In the case of integro-differential and other classes of non-local operators, the study of inverse problems are more complicated than the case of differential an local operators and the classical methods either are not applicable to them or require essential modifications. In this exposition, an inverse spectral problem of Sturm-Liouville energy-dependent integro-differential operator with point $\delta-$interaction is studied. Furthermore, a uniqueness result for the inverse spectral problem of Sturm-Liouville operator with integral delay is obtained.

Keywords

Sturm-Liouville operator, Inverse spectral problem, Point $\delta-$interaction

On weak transition operators in the general spectral stability theorem

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Abstract

Let $\mathcal{H}$ be a Hilbert space and $\mathrm{Dom}(H_1)$ and $\mathrm{Dom}(H_2)$ be subsets of $\mathcal{H}$.

The definition of a *weak transition operator* is of interest from the following point of view: when we are going to estimate the eigenvalues $\lambda_n[H_1]$ of the first operator $H_1 : \mathrm{Dom}(H_1) \to \mathcal{H}$ via the eigenvalues $\lambda_n[H_2]$ of the second operator $H_2 : \mathrm{Dom}(H_2) \to \mathcal{H}$, it suffices to construct a weak transition operator T_{12}^w from H_1 to H_2 with the parameters $a_n, b_n, \delta_n', \delta_n''$ and measure of vicinity $\delta(H_1, H_2)$, that is an operator satisfying the following properties:

(i) $(T_{12}^w f, T_{12}^w f)_{\mathcal{H}_2} \geq 1 - a_n \delta(H_1, H_2)$, if $\delta(H_1, H_2) < \delta_n'$,

(ii) $(H_2^{1/2} T_{12}^w f, H_2^{1/2} T_{12}^w f)_{\mathcal{H}_2} \leq \lambda_n[H_1] + b_n \delta(H_1, H_2)$, if $\delta(H_1, H_2) < \delta_n''$.

Then

$$\lambda_n[H_2] \leq \lambda_n[H_1] + c_n \delta(H_1, H_2)\,, \tag{9}$$

if $\delta(H_1, H_2) < \xi_n$, where

$$c_n = 2(a_n \lambda_n[H_1] + b_n), \qquad \xi_n = min\{\delta_n', \delta_n'', (2a_n)^{-1}.\}$$

This estimate can also be obtained with the help of a transition operator [1]-[2], but sometimes it is easier to construct a weak transition operator rather than a transition operator.

References

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Porosity Convergence and Porosity Cluster Points in Metric Spaces

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Abstract

In this study, we will define a new type of convergence called d_p-convergence for metric valued sequences by using the definition of porosity in metric spaces. Then we will define porosity cluster points for metric valued sequences by the same way. Finally, we will investigate the relationship between this new concepts.

Keywords

Porosity, Metric Space, Porosity Convergence, Porosity Cluster Point

Reference

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Solitons in optical metamaterials with anti-cubic nonlinearity by extended $G'/$G-expansion approach

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Abstract

This paper addresses optical solitons in nonlinear negative-index materials with anti-cubic nonlinearity. The perturbed nonlinear Schrödinger equation, which describes the dynamics of soliton propagation through optical metamaterials, is studied analytically. Extended $G'/G-$expansion approach is utilized to solve the mathematical-physical model and then hyperbolic, trigonometric and rational function solutions are obtained. Also bright, dark and singular solitons emerge from these solutions under some particular cases.

Keywords

Solitons, Metamaterials, Anti-cubic nonlinearity

Soliton and other solutions in nonlinear negative-index materials

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Abstract

This paper obtains Jacobi elliptic function solutions for optical metamaterials. Anti-cubic nonlinearity is taken into account. Extended Jacobi's elliptic function expansion scheme is employed to extract these solutions to the nonlinear Schrödinger equation. Singular periodic waves or dark solitons or singular solitons also fall out from these elliptic solutions, as the modulus of ellipticity tends to zero or unity.

Keywords

Solitons, Jacobi elliptic functions, Negative-index materials, Anti-cubic nonlinearity

Embedding theorems on generalized Besov space

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Abstract

In the abstract we introduce a space

$$\bigcap_{i=0}^{n} \bigwedge_{p^i,\theta_i}^{<m^i,N^i>} (G,\varphi^i) \tag{10}$$

and studied with points of view embedding theorems some properties of functions from this spaces. The norm in a space (10) defines as

$$\|f\|_{\bigcap_{i=0}^{n} \bigwedge_{p^i,\theta_i}^{<m^i,N^i>}(G,\varphi^i)} = \sum_{i=1}^{n} \|f\|_{\bigwedge_{p^i,\theta_i}^{<m^i,N^i>}(G,\varphi^i)},$$

$$\|f\|_{\bigwedge_{p^i,\theta_i}^{<m^i,N^i>}(G,\varphi^i)} = \left\{ \int\limits_{E_{E_{N^i}}} \| \frac{\Delta^{N^i}(\frac{t}{N^i},G)D^{m^i f}}{\prod\limits_{j\in E_{N^i}} \varphi_j(t)} \|_{p_i}^{\theta_i} \frac{dt}{t} \right\}^{\frac{1}{\theta_i}},$$

where $\frac{dt}{t} = \prod\limits_{j\in E_{N^i}} \frac{dt_j}{t_j}$, $G \in R^n$, $1 \le p_i, \theta_i \le \infty$, $m^i = (m_1^i, \ldots, m_n^i)$, $m_j^i \ge 0$ are integers, $N_j^i \ge 0$ are integer $(j = 1, 2, \ldots, n, i = 0, 1, \ldots, n)$; $\varphi(t) = (\varphi_1(t_1), \ldots, \varphi_n(t_n))$, $\varphi_j(t_j) > 0 (t_j \ne 0, j = 1, 2, \ldots, n)$; $\varphi_j(t_j) \to 0 (|t_j| \to 0, j = 1, 2, \ldots, n)$; $E_{N^i} = suppN^i$; i.e. E_{N^i} is the set of indices of nonzero elements of a vector N^i.

Embedding theorems of the type

1. $D^\nu : \bigcap\limits_{i=0}^{n} \bigwedge_{p^i,\theta_i}^{<m^i,N^i>}(G,\varphi^i) \hookrightarrow L_q(G)$;

2. $D^\nu : \bigcap\limits_{i=0}^{n} \bigwedge_{p^i,\theta_i}^{<m^i,N^i>}(G,\varphi^i) \hookrightarrow \bigwedge_{q,\theta}^{<m,N>}(G,\varphi)$

is holds.

Keywords

generalized Besov space, embedding theorem, generalized derivatives.

Characterizations for the nonsingular integral operator and its commutators on generalized Orlicz-Morrey spaces

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Abstract

This abstract continuity in generalized Orlicz-Morrey spaces $M^{\Phi,\varphi}(\mathbb{R}^n_+)$ of nonsingular integral operators and its commutators with BMO functions. So that give necessary and sufficient conditions for the boundedness of the nonsingular integral operator and its commutators on generalized Orlicz-Morrey spaces $M^{\Phi,\varphi}(\mathbb{R}^n_+)$ see [1].

[1] A. Eroglu, V. S. Guliyev, M. N. Omarova, *Characterizations for the Nonsingular Integral Operator and its Commutators on Generalized Orlicz-Morrey Spaces*, Azerbaijan journal of mathematics, 7(2) (2017), 1-21

Keywords

Generalized Orlicz-Morrey spaces; nonsingular integral; commutator; BMO

Common Fixed Point Results For The (F, L)-Weak Contraction On Complete Weak Partial Metric Spaces

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Abstract

In this paper, we define the concepts of (F, L)-contraction and (F, L)-weak contraction in weak partial metric space which is generalized metric space. Using these concepts we prove some common fixed point theorems for two self mappings and we give some fixed point results for a single mapping in weak partial metric spaces. Also, we give some examples to support our new results. The theorems obtained here extend and generalize many results in the literature.

Keywords

(F, L)-contraction, (F, L)-weak contraction, Fixed point, Common fixed point, Weak partial metric space

On the Characterizations of Timelike Curves which Spherical Indicatrices are Conics in Minkowski 3-space

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Abstract

In this study, we investigate timelike T-conical helix in Minkowski 3-space. Moreover, we obtain characterization of this curve and give some parametric equations for its. Also related examples and their illustrations are drawn with Mathematica 10.1.

Keywords

Conics, spherical curve, spherical conics

Reference

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On Generalized Deferred Cesro Mean

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Abstract

In this work, using the genealized dierence operator we introduce some new sequence spaces and investigate some topological properties of these sequence spaces.

Keywords

Difference Sequence, Cesàro Summability, Deferred Cesaro mean

Variation Diminishing Convolution Kernels Associated with Second Order Differential Operators

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Abstract

In this paper, we generalize the theory of variation diminishing kernels introduced by I. I. Hirschman, Jr. and P. L. Van De Wetering for a class of singular second-order differential operators introduced by Chébli and Trimèche. We give a necessary and sufficient condition such that a function Λ is a variation diminishing convolution kernel.

Keywords

Variation diminishing, Fourier transform, inversion formula, convolution kernel.

Boundedness in weighted Lebesgue spaces of Riesz potentials on commutative hypergroups

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Abstract

Consider a commutative hypergroup $(K, *_K)$, with a point measures δ_x and an identity $e \in K$. It is well known that every commutative hypergroup K possesses a Haar measure which will be denoted by λ. If K is a commutative hypergroup, then the convolution of two functions is defined by

$$f *_K \varphi(x) = \int_K T^x f(y)\varphi(y^{\sim})d\lambda(y),$$

where $T^x f$ generalized translation operator and $\sim$ is an involution on K.
Let $1 \leq p < \infty$ and w is a non-negative and measurable function on K, i.e. w is a non-negative and measurable function on K. The weighted Lebesgue space $L^p_w(K, \lambda)$ is a set of all classes of λ -measurable on K functions f with finite norm

$$\|f\|_{K,p,w} = \left(\int_K |f(x)|^p w(x) d\lambda(x) \right)^{\frac{1}{p}}$$

Let f be a λ-measurable function defined on the hypergroup K. The distribution function λ_f of a λ-measurable on K function f is given by $\lambda_f(s) = \lambda\{x : x \in K, |f(x)| > s\}$, for $s \geq 0$. With the distribution function we associate a rearrangement of f on $[0, \infty)$ defined by

$$f^*_K(t) = \inf\{s > 0 : \lambda_f(s) \leq t\}.$$

Let $(K, *)$ be a commutative hypergroup, with the quasi-metric ρ and Haar measure λ and $B(x, r) = \{y \in K : \rho(x, y) < r\}$. Define a function $\Lambda_x(y) = T^x \chi_{B(e,r)}(y^{\sim})$.
We will assume that there exist constants $c_1 > 0$, $c_2 > 0$ and $c_3 > 0$ such that for every $x, y \in K$ and $r > 0$

$$supp\Lambda_x(\cdot) \subset B(x, c_1 r) \tag{11}$$

and

$$\lambda B(x, r) T^x \chi_{B(e,r)}(y^{\sim}) \leq c_2 \lambda B(e, r) \leq c_3 r^N. \tag{12}$$

Define Riesz potential

$$I_\alpha^K f(x) = (f *_K \rho(e,\cdot)^{\alpha-N})(x),\ for\ 0<\alpha<N$$

Theorem Let $(K,*)$ be a commutative hypergroup, with the quasi-metric ρ and doubling Haar measure λ satisfying the conditions (13), (12). Suppose that $0<\alpha<N$, $1<r<\frac{\alpha}{N}$, $1<p\le q<+\infty$, and u and v are non-negative λ-locally integrable functions on K with conditions

$$\sup_{s>0}\left(\int_s^\infty u_K^*(t)t^{-q(1-\frac{\beta}{Q})}dt\right)^{\frac{1}{q}}\left(\int_0^s\left(\left(\frac{1}{v}\right)_K^*(t)\right)^{p'-1}dt\right)^{\frac{1}{p'}}<\infty$$

and

$$\sup_{s>0}\left(\int_0^s u_K^*(t)t^{-q(\frac{1}{r}-\frac{\beta}{Q})}dt\right)^{\frac{1}{q}}\left(\int_s^\infty\left(\left(\frac{1}{v}\right)_K^*(t)\right)^{p'-1}t^{p'(\frac{1}{r}-1)}dt\right)^{\frac{1}{p'}}<\infty.$$

Then $I_\alpha^K f$ is a bounded operator from $L_v^p(K,\lambda)$ to $L_u^p(K,\lambda)$.

Keywords

hypergroup, Riesz potential, weighted Lebesgue space

On Some Geometric Properties That Imply The Fixed Point Property

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Abstract

We show that Banach $c_0(\Gamma)$ with Day's norm space satisfy the weak fixed point property , and prove the relationship between the weakly 2-rotund (W2R) and the fixed point property of Banach spaces under renorming . Moreover distinguish between this property and other geometrical properties that imply the fixed point property.

Keywords

Fixed point property; Day's norm; Weakly 2-rotund

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A New Approach Comparison of the Farthest Point Map in Fuzzy and Classic n-Normed Spaces with Examples

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Abstract

In this paper, we have studied comparison of the farthest point map in different normed spaces with example. First of all we give some definition and theorem. Then we have compared with examples using the definitions we gave earlier and we show that the farthest point maps and farthest point sets are equal in different normed spaces.

Keywords

Fuzzy n-Normed Spaces, Farthest Point Map, Farthest Point Set

λ-Statistical Convergence in Fuzzy Normed Linear Spaces

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Abstract

In this paper, we introduce $\lambda-$statistical convergence and condition of being $\lambda-$statistical Cauchy of real number sequences in a fuzzy normed linear spaces. At the same time , in fuzzy normed space we have introduced concept of (V,λ) summability and $(C,1)$ summability and then we have studied the relation between these concepts and $\lambda-$statistical convergence.

Keywords

$\lambda-$Statistical Convergence, Fuzzy Normed Linear Space, Summability

Singularities of Ruled Surfaces and Legender Curves

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Abstract

In this paper, firstly we give a brief summary of the concepts Legender curves and ruled surfaces. Afterwards, we give a one-to-one correspondence between these curves and surfaces.Finally, we study the singularities of these surfaces.

Keywords
Singularity, Ruled Surface, Legender Curve

A Study on Complexified Semi-Quaternions

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Abstract

In this paper, firstly we give a brief summary of the concepts real-quaternions and semi-quaternions. Afterwards, we consider the basic algebraic properties of complexified semi-quaternions.

Keywords

Real-Quaternion, Semi-Quaternion, Complexi.ed Semi-Quaternion

The boundedness of the Hardy-Littlewood maximal operator

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Abstract

In this work we give boundedness of Hardy-Littlewood maximal operator on the Lebesgue spaces and some sufficient conditions for the boundeddness of the maximal operator in the weighted variable exponent Lebesgue spaces.

Referances:

Mamedov Farman I. ; Zeren Yusuf on boundedness of fractional maximal operator in weigted variable exponent Lebesgue Spaces Math İnequal Apply.19(2016)

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Keywords

Hardy-Littlewood maximal operator, boundedness, the boundedness weighted variable exponent Lebesgue spaces.

Norm and endpoint estimates for commutators of fractional maximal function

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Abstract

The fractional maximal commutator $C_{b,\alpha}$ and commutator of fractional maximal function $[b, M_\alpha]$ for appropriate functions b and f are defined as follows:

$$C_{b,\alpha}f(x) := \sup_{B\ni x} |B|^{\frac{\alpha-n}{n}} \int_B |b(y) - b(x)||f(y)|dy,$$

$$[b, M_\alpha]f := bM_\alpha f - M_\alpha(bf),$$

where $0 < \alpha < n$.

Main purpose of this talk is to present some pointwise estimates for $C_{b,\alpha}$ and $[b, M_\alpha]$. Using these estimates we obtain norm and endpoint estimates for $C_{b,\alpha}$ and $[b, M_\alpha]$.

Keywords

Commutator, Fractional Maximal Operator, BMO

Some fixed point results for a new class of multivalued operators in the metric spaces

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Abstract

In this study, we define a class of multivalued WR operators in the metric spaces. It is shown that a member of class of WR operators is a multivalued weakly Picard operator and the Picard projection iteration converges to a fixed point of this operator. Some Collage and data dependence results are obtained for the class of multivalued WR operator.

Keywords

multivalued operator, fixed point, data dependence

On Certain Modified Balázs-Szabados Operators in Polynomial Weight Spaces

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Abstract

In this paper we consider certain modified Balázs-Szabados operators which were firstly used by K.Balázs and J. Szabados. We give pointwise estimates in framework of weighted functions spaces and study approximation properties of these operators. Also we establish a Voronovskaja type theorem in the same weighted spaces for the same operators.

Keywords

Approximation, linear and positive operator, Voronovskaja-type theorem

A Numerical Application for Some Modfiied Operators

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Abstract

The main aim of this study is verify the theoretical results that the convergence of the operators depends on the parameters with the numerical experiments. First we give approximation properties of some modified linear positive operators. Then we give a theorem concerning pointwise convergence and obtain the rate of convergence. Finally we made a comparison between these operators by figures and by calculating the errors and give an illustrative example which shows that numerical result verify the theoretical results in the approximations.

Keywords

Approximation, Operator, Numerical Application, Figure

Some Fixed Point Results About Multivalued Almost F-Contraction with α-Admissible Mapping

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Abstract

In this study, we define multivalued almost F-contraction under multivalued α-admissible mappings. Also, we obtain some fixed point results associated multivalued almost F-contraction with α-admissible mappings and to investigate some properties of this mappings.

Keywords

Multivalued mappings, α-admissible mappings, almost F-contraction, fixed points.

Reference

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Necessary conditions for the absolute matrix summability of infinite series

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Abstract

In this paper, we obtained the necessary conditions for two general summability methods. Some new and known results are also obtained.

Keywords

Absolute matrix summability, infinite series, Hölder inequality, Minkowski inequality

Generalized maximal functions in classical Lorentz spaces

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Abstract

In this talk we present the complete characterization of the boundedness of the generalized maximal operator

$$M_{\phi,\Lambda^\alpha(b)}f(x) := \sup_{Q\ni x} \frac{\|f\chi_Q\|_{\Lambda^\alpha(b)}}{\phi(|Q|)} \qquad (x\in\mathbb{R}^n),$$

between the classical Lorentz spaces $\Lambda^p(v)$ and $\Lambda^q(w)$ for appropriate functions ϕ, where $0<p,q<\infty$, $0<\alpha\le r<\infty$, v,w,b are weight functions on $(0,\infty)$ such that $0<B(x):=\int_0^x b<\infty$, $x>0$, $B\in\Delta_2$ and $B(t)/t^{\alpha/r}$ is quasi-increasing.

Keywords

Maximal functions, Lorentz spaces, Iterated Hardy inequalities involving suprema, Weights

Interpolation Theorems for Besov-Morrey type Spaces

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Abstract

In the abstract we study a differential and differential-difference properties of functions from intersection of Besov-Morrey type space $B^{l^\mu}_{p_\mu,\theta_\mu,\varphi,\beta}(G)$ $(\mu=1,2,\dots,N)$, where $G\subset R^n$, $1\le p_\mu<\infty$, $1\le\theta_\mu\le\infty$, $l^\mu=(l^\mu_1,l^\mu_2,\dots,l^\mu_n)$, $l^\mu_j>0$ $(j=1,2,\dots,n)$, $\mu=1,2,\dots,N$; $\varphi(t)=(\varphi_1(t),\dots,\varphi_n(t))$, $\varphi_j(y)>0$ $(t>0, j=1,2,\dots,n)$ is continuously differentable functions; $\lim\limits_{t\to+0}\varphi_j(t)=0$, $\lim\limits_{t\to+\infty}\varphi_j(t)=\infty$, and $\beta\in[0,1]^n$.

The spaces $B^{l^\mu}_{p_\mu,\theta_\mu,\varphi,\beta}(G)$ is defined as a linear normed space of functions f, on G, with the finite norm $(m_i>l_i-k_i>0\ (i=1,...,n))$:

$$\|f\|_{B^l_{p,\theta,\varphi,\beta}(G)}=\|f\|_{p,\varphi,\beta;G}+$$

$$+\sum_{i=0}^{n}\left\{\int_0^{t_0}\left[\frac{\left\|\Delta_i^{m_i}(\varphi_i(t),G_{\varphi(t)})D_i^{k_i}f\right\|_{p,\varphi,\beta}}{(\varphi_i(t))^{(l_i-k_i)}}\right]^\theta\frac{d\varphi_i(t)}{\varphi_i(t)}\right\}^{\frac{1}{\theta}},$$

where

$$\|f\|_{p,\varphi,\beta;G}=\|f\|_{L_{p,\varphi,\beta}(G)}=\sup_{\substack{x\in G,\\ t>0}}\left(|\varphi([t]_1)|^{-\beta}\|f\|_{p,G_{\varphi(t)}(x)}\right)$$

$$G_{\varphi(t)}(x)=G\cap I_{\varphi(t)}(x)$$

$$=G\cap\left\{y:|y_j-x_j|<\frac{1}{2}\varphi_j(t),(j=1,2,...,n)\right\}.$$

and t_0 is a fixed positive number, $l\in(0,\infty)^n$, $m_i\in N$, $k_i\in N_0$; $|\varphi([t]_1)|^{-\beta}=\prod\limits_{j=1}^{n}(\varphi_j([t]_1))^{-\beta_j}$, $[t]_1=\min\{1,t\}$.

By the method of integral representations of functions, embedding theorems of the type

1. $D^\nu:\bigcap\limits_{\mu=1}^{N}B^{l^\mu}_{p_\mu,\theta_\mu,\varphi,\beta}(G)\hookrightarrow L_{q,\psi,\beta}(G)$ $(C(G))$

2. $D^\nu:\bigcap\limits_{\mu=1}^{N}B^{l^\mu}_{p_\mu,\theta_\mu,\varphi,\beta}(G)\hookrightarrow B^{l^1\mu}_{q,\theta_1,\psi,\beta_1}(G)$ $(\theta_\mu\le\theta_1,\mu=1,2,\dots,N;l^1\in(0,\infty)^n)$ is holds;

3. it is also proved that for the function from space $\bigcap_{\mu=1}^{N} B^{l_\mu}_{p_\mu,\theta_\mu,\varphi,\beta}(G)$ $(\mu = 1, 2, \ldots, N)$, the generalized derivatives $D^\nu f$ satisfy the Hölder condition in the metric $L_q(G)$ and $C(G)$.

Keywords

Besov-Morrey spaces, embedding theorem, generalized derivatives.

A New Penalty Function Approach for Inequality Constrained Optimization Problems

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Abstract

In this study, we introduce a new smooth penalty function for nonlinear inequality constrained optimization problems. We construct a new algorithm depend on the new penalty function. Finally, we illustrate the efficiency of the algorithm on some numerical examples.

Keywords

Constrained Optimization, Smoothing Technique, Penalty Function, Algorithm

On the Hardy averaging operator in variable exponent weighted Lebesgue spaces

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Abstract

Let $\Re(0,\infty)$ denote the class of all Lebesgue-measurable functions on $(0,\infty)$. We denote by $\wp(0,\infty)$ the set of all functions $p \in \Re(0,\infty)$ defined on $(0,\infty)$ such that

$$1 < \inf_{x\in(0,\infty)} p(x) := p^- \le p(x) \le \sup_{x\in(0,\infty)} p(x) := p^+ < \infty.$$

We define the variable exponent Lebesgue space $L^{p(\cdot)}(0,\infty)$ to consist of functions $f \in \Re(0,\infty)$, $f:(0,\infty)\to\mathbb{R}$ such that the modular

$$\rho_{p(x)}(f) = \int_0^\infty |f(x)|^{p(x)}\,dx$$

is finite. If $p^+ < \infty$, then

$$\|f\|_{p(x)} = \inf\left\{\lambda > 0 : \rho_{p(x)}\left(\frac{f(x)}{\lambda}\right) \le 1\right\}$$

defines a norm on $L^{p(\cdot)}(0,\infty)$ (see [1],[2]). We say that the exponent $p:(0,\infty)\to[1,\infty)$ is log-Hölder continuous at the origin and infinity respectively if there exist constants $A_{\log}, B_{\log} > 0$ such that

$$|p(x) - p(0)| \le \frac{A_{\log}}{\log\frac{1}{x}} \tag{1}$$

for $x \in \left(0, \frac{1}{2}\right]$, and

$$|p(t) - p_\infty| \le \frac{B_{\log}}{\log(e+x)} \tag{2}$$

for $x \in (0,\infty)$, where $p(0), p_\infty \in [1,\infty)$. Condition (2) implies that there is some number $p_\infty > 1$ such that $p(x)\to p_\infty$ as $|x|\to\infty$, and this limit holds uniformly in all directions. Denote by $\wp^{\log}(0,\infty)$ the class of variable exponents satisfy the conditions (1) and (2). Given a function $p \in \Re(0,\infty)\cap\wp^{\log}(0,\infty)$ and $\alpha \in \Re(0,\infty)$ with $-\infty < \alpha^- \le \alpha(x) \le \alpha^+ < \infty$ for $x \in (0,\infty)$, we define the functional

$$\rho_{p(x),\alpha(x)}(f) = \int_0^\infty |f(x)|^{p(x)}\, x^{\alpha(x)}dx < \infty$$

the corresponding Luxemburg norm

$$\|f\|_{p(x),\alpha(x)} = \inf\left\{\lambda > 0 : \rho_{p(x),\alpha(x)}\left(\frac{f(x)}{\lambda}\right) \leq 1\right\}$$

and the corresponding weighted variable exponent Lebesgue space

$$L^{p(x)}_{\alpha(x)}(0,\infty) = \left\{f \in \Re(0,\infty) : L^{p(x)}_{\alpha(x)}(0,\infty) < \infty\right\}.$$

Denote

$$p^-_{x,k} = \min\left\{p(x), \inf_{t\in\Omega_{k,x}} p(t)\right\},\ p^+_{x,k} = \max\left\{p(x), \inf_{t\in\Omega_{k,x}} p(t)\right\},\ x > 0$$

where $\Omega_{k,x} := \left(2^{-k-1}x, 2^{-k}x\right]$, $k \in \mathbb{N}$ (see [3],[4]). We consider the Hardy averaging operator

$$A(f)(x) = \frac{1}{x}\int_0^x f(y)dy.$$

By $L^{1,p(x)}_{\alpha(x)}(0,\infty)$ we denote the set of absolutely continuous functions f such that $f' \in L^{p(x)}_{\alpha(x)}(0,\infty)$.

In the present paper, we investigate a inequality for function f lies in the Lebesgue space $L^{1,p(x)}_{\alpha(x)}(0,\infty)$ with variable exponent $p(x)$. Let $f \in L^{1,p(x)}_{\alpha(x)}(0,\infty)$ and p, q, $\alpha \in \Re(0,\infty) \cap \wp^{\log}_{0,\infty}(0,\infty)$. If $\left(1-\alpha^+_{k,x}\right)p^-_{k,x} > 1$, $\alpha^+_{k,x}\left(p^-_{k,x}\right)' < 1$, $1 < p^- \leq p(x) \leq q(x) \leq q^+ < \infty$ and $-\infty < \alpha^- \leq \alpha(x) \leq \alpha^+ < \infty$ for $x \in (0,\infty)$, then there exists a constant $C > 0$, depending on only p^-, q^+ and α^-, such that

$$\|A(f) - f\|_{q(x),\beta(x)} \leq C\left\|f'\right\|_{p(x),\alpha(x)}$$

where

$$\beta(x) = \alpha(x) - \frac{1}{p'(x)} - \frac{1}{q(x)}.$$

Keywords: variable exponent Lebesgue space; Hardy averaging operator.

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On the sub-supersolution method for p(x)-Laplacian equations

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Abstract

We consider the existence of positive solutions for elliptic problems with variable exponent of the form

$$\begin{cases} -\triangle_{p(x)}u = f(x,u) \text{ in } \Omega, \\ u(x) > 0 \text{ in } \Omega, \\ u = 0 \text{ on } \partial\Omega, \end{cases} \tag{P}$$

where Ω is a bounded domain in $\mathbb{R}^3$ with C^2 boundary and

$$-\triangle_{p(x)}u = -div(|\nabla u|^{p(x)-2}\nabla u)$$

with $\nabla u = (\partial_{x_1}u, \partial_{x_2}u, \partial_{x_3}u)$ which is so-called $p(x)$-Laplacian with $2 < p(x) < 3$, $x \in \Omega$. The sub-supersolution principle for $p(x)$-Laplacian is based on the properties of $p(x)$-Laplace and also from the results obtained in [1]. In particular, we give the asymptotic behavior of solutions of a simpler equation which is useful for finding supersolutions of differential equations with variable exponents, which is of independent interest.

Let $f \in C(\Omega \times \bar{\mathbb{R}}, \mathbb{R})$ is a continuous function satisfies conditions: (f_1) :

(f_1) :

$$|f(x,t)| \leq a_1(x) + b_1|t|^{q(x)+1}, \ a_1 + b_1 > 0, \quad a_1, b_1 \geq 0,$$

where

$$q(x) + 2 < p^*(x) = \frac{3p(x)}{3 - p(x)}.$$

(f_2) :

$$f_t'(x,t) \geq 0 \text{ and } \left|f_t'(x,t)\right| \leq a, \ (x,t) \in \Omega \times \mathbb{R}, \alpha \geq 0.$$

Denote by $S(\Omega)$ be the set of all measurable real-valued functions defined in Ω. For $u, v \in S(\Omega)$, we write $u \leq v$ if $u(x) \leq v(x)$ for a.e. $x \in \Omega$ and $u^+(x) = \max\{u(x), 0\}$ and $u^-(x) = \min\{-u(x), 0\}$. Let $u^-, u^+ \in W^{1,p(x)}(\Omega) \cap C\left(\overline{\Omega}\right)$ satisfy $u^-, u^+ > 0$ in Ω. We say u^- and $u^+$are a subsolution and a supersolution of (P) respectively, if

$$\int_\Omega \left|\nabla u^-\right|^{p(x)-2}\nabla u^- \nabla v dx \leq \int_\Omega f(x,u^-)v dx, v \geq 0,$$

$$\int_{\Omega} \left|\nabla u^{+}\right|^{p(x)-2} \nabla u^{+} \nabla \upsilon dx \geq \int_{\Omega} f(x, u^{+}) \upsilon dx, \ \upsilon \geq 0,$$

for all $\upsilon \in C_0^{\infty}(\Omega)$ with $\upsilon \geq 0$ and $supp(\upsilon) \subset\subset \Omega$. The basic principle of sub-supersolution method for (P) can be stated as follows.

Suppose that $(f_1), (f_2)$ holds and $u^{-}, u^{+} \in W^{1,p(x)}(\Omega) \cap C\left(\overline{\Omega}\right)$. Let u^{-} and u^{+} be a subsolution and a supersolution of (P) respectively satisfying $u^{-} \leq u^{+}$ in Ω and $u^{+} \geq 0$, $u^{-} \leq 0$ on $\partial\Omega$. Then (P) has a solution $u \in W^{1,p(x)}(\Omega) \cap C\left(\overline{\Omega}\right)$ satisfy $u^{-} \leq u \leq u^{+}$.

Keywords

$p(x)$-Laplacian; sub-supersolution method.

References

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Spectral Analysis of Hill operator On lassoshaped graph

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Abstract

Consider a graph consisting of a loop attached to a half line where the loop is in a homogeneous magnetic field perpendicular to the loop plane.

The cycle and half line are parametrized by the parameter $x \in [0, 2L]$ and $x \in (0, \infty)$ respectively.

We can assume without loss of generality absence of multiple edges and loops by introducing additional vertex on the loop that is will break down it.

Thus the graph G has vertices v_0, v_1, v_2 and edges e_1, e_2, e_3. It is convenient for us to choose the following orientation: e_1 corresponds to half line where v_0 is internal vertex , e_2, e_3 are parts of cycle obtaining after introducing additional vertex on the loop

The Hilbert space of this system is

$$H = L_2(G) = L_2(0, L) \oplus L_2(0, L) \oplus L_2(R_+)$$

An integrable function Y on G may be represented as $Y = y_j$,$j = 1, 2.3$, where the function $y_j(x)$, is defined on the edge e_j, $j = 1, 2, 3$. Let $q = q_j$, $j = 1, 2, 3$ be an integrable complex-valued function on G; $q = q_j$ is called the potential. Consider the following differential equations on G

$$y_j''(x) + (\lambda^2 - q_j(x))y_j(x) = 0, \quad j = 1, 2, 3 \tag{13}$$

We put emphasis on the analytical solution of the problem. Furthermore, we shall be concerned with the decay and scattering properties of the system. An explicit description of the resolvent is given and the spectrum is described exactly, the inverse problem with respect to the reflection coefficients is solved.

Keywords

Hill operator, lassoshaped graph

On the weighted pseudo almost periodic solutions of Liénard-type system with time-lag

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Abstract

This paper consider a class of Liénard-type system with a variable time-lag. By using fixed point theorem, theory of weighted pseudo almost periodic functions and differential inequality techniques, we obtain sufficient conditions for the existence and uniqueness of weighted pseudo almost periodic solutions of the system considered. An example is given to demonstrate the effectiveness and improvements of the proposed results. By this work, we improve some results found in the literature and do a contribution to the literature.

Keywords

Weighted pseudo almost periodic solution, Liénard system, existence and uniqueness, fixed point theorem

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On Hardy inequality in weighted variable Lebesgue spaces with mixed norm

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(Joint work with A. Serbetci and S. G. Hasanov)

Abstract

In this abstract a two-weight boundedness of two-dimensional Hardy operator and its dual operator in variable Lebesgue spaces with mixed norm is reduced. In particular, we give a criterion for the boundedness of two-dimensional Hardy operator and its dual operator in variable Lebesgue spaces with mixed norm (see [1]).

[1] R. A. Bandaliyev, A. Serbetchi, S. G. Hasanov, *On Hardy inequality in variable Lebesgue spaces with mixed norm.* (submitted)

Keywords

Two-dimensional Hardy operator; weight functions; variable Lebesgue spaces with mixed norm

The link between orthomorphisms and bi-orthomorphisms

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Abstract

We investigate the connection between the space $Orth(A)$ of orthomorphisms on a Riesz space A and the space $Orth(A, A)$ of bi-orthomorphisms on $A \times A$. In particular, the necessary and sufficient conditions for $Orth(A, A)$ to be equipped with a structure of f-algebra and $Orth(A)$ to be a band in $Orth(A, A)$ are given.

Keywords

Riesz space, f-algebra, orthomorphism, bi-orthomorphisms

Bilinear Hardy inequalities

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Abstract

The aim of this talk is to present another characterization of validity of the weighted bilinear Hardy inequality

$$\left(\int_0^\infty \left(\int_0^\infty f \int_0^\infty g\right)^q w(t)\,dt\right)^{1/q} \le C\left(\int_0^\infty f^{p_1} v_1\right)^{1/p_1} \left(\int_0^\infty f^{p_2} v_2\right)^{1/p_2}$$

for all non-negative f, g on $(0,\infty)$, for $1 < p_1$, p_2, $q < \infty$.

Keywords

Hardy operators, bilinear operators, weights, operator inqeualities

Parametric Marcinkiewicz integral operator on generalized Orlicz-Morrey spaces

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Abstract

In this abstract we study the boundedness of the parametric Marcinkiewicz integral operator μ_Ω^ρ on generalized Orlicz-Morrey spaces $M_{\Phi,\varphi}$. We find the sufficient conditions on the pair $(\varphi_1, \varphi_2, \Phi)$ which ensure the boundedness of the operators μ_Ω^ρ from one generalized Orlicz-Morrey space M_{Φ,φ_1} to another M_{Φ,φ_2}. As an application of the above result, the boundedness of the Marcinkiewicz operator associated with Schrödinger operator μ_j^L on generalized Orlicz-Morrey spaces is also obtained [1], see also [2], [3].

Reference

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Keywords

Parametric Marcinkiewicz integrals, generalized Orlicz-Morrey spaces

Hardy operators in grand Lebesgue spaces

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Abstract

Grand Lebesgue spaces on sets of infinite measure are defined with using an additional characteristic $a(\cdot)$ called a grandizer. Conditions on the grandizer $a(x)$ for the Hardy operators to be bounded in the grand Lebesgue spaces $L_a^{p)}(\mathbb{R}^n)$ are found, and the lower and upper estimates for a sharp constant in the one-dimensional and multidimensional Hardy inequalities are given in dependence on the grandizer. For some special choice of the grandizer it is proved that this sharp constant is equal to the sharp constant for the classical Lebesgue spaces.

Keywords

Lebesgue spaces, grand Lebesgue spaces, Hardy operators, lower and upper estimates

An analogue of Young's inequality for convolutions in Morrey-type spaces of sequences

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Abstract

Definition: Let $w = \{w(k)\}_{k\in\mathbb{N}}$ be a positive and non-zero sequence and $0 < p, \theta \leq \infty$. The global Morrey-type space of sequences $gm_{p\theta,w(.)} = gm_{p\theta,w(.)}(\mathbb{Z})$ is the space of all the sequences $a = \{a_m\}_{m\in\mathbb{Z}^\times}$ with the bounded quasinorm

$$\|a\|_{gm_{p\theta,w(.)}} = \sup_{m\in\mathbb{Z}^n} \|w(k)\|a\|_{l_p(B(m,k))}\|_{l_\theta}$$

Where $B(m,k)$ is the ball centered at the point $m \in \mathbb{Z}^n$ of radius $k \in \mathbb{N}$

Lemma: Let $w = \{w(k)\}_{k\in\mathbb{N}}$ be a positive and non-zero sequence and $0 < p, \theta \leq \infty$. The global Morrey-type space of sequences $gm_{p\theta,w(.)}$ contains not only the zero sequence if, and only if, $w \in l_\theta$

Theorem: If

$$1 \leq p_1, p_2 \leq p \leq \infty$$

$$p_1 \leq \theta_1 \leq \infty$$

$$p_2 \leq \theta_2 \leq \infty$$

$$0 \leq \alpha_1, \alpha_2 \leq \infty$$

$$\frac{1}{p_1} + \frac{1}{p_2} = \frac{1}{p} + 1$$

$$\frac{\alpha_1}{p_1} + \frac{\alpha_2}{p_2} = \frac{1}{p}$$

$$\frac{\alpha_1}{\theta_1} + \frac{\alpha_2}{\theta_2} = \frac{1}{\theta}$$

and $w_1 \in l_{\theta_1}, w_2 \in l_{\theta_2}; w(k) = w_1^{\alpha_1}(k)w_2^{\alpha_2}(k), k \in \mathbb{N}$. Then $w \in l_\theta$ and for all $a_k \in gm_{p_k\theta_k,w_k(.)}, k = 1, 2$, the convolution $a_1 * a_2$ exists in $\mathbb{Z}^n$ and

$$\|a_1 * a_2\|_{gm_{p\theta,w(.)}} \leq \|a_1\|^{\alpha_1}_{gm_{p_1\theta_1,w_1(.)}}\|a_1\|^{1-\alpha_1}_{l_{p_1}}\|a_2\|^{\alpha_2}_{gm_{p_2\theta_2,w_2(.)}}\|a_2\|^{1-\alpha_2}_{l_{p_2}}$$

For convolutions of functions in the global Morrey-type space this theorem was proved in [1]

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On the boundedness of Dunkl-type maximal function in the generalized Dunkl-type Morrey spaces

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Abstract

Let $\alpha > -1/2$ be a fixed number and μ_α be the weighted Lebesgue measure on $\mathbb{R}$, given by

$$d\mu_\alpha(x) := \left(2^{\alpha+1}\Gamma(\alpha+1)\right)^{-1} |x|^{2\alpha+1}\, dx.$$

Let $B(x,t) = \{y \in \mathbb{R} : |y| \in]\max\{0, |x|-t\}, |x|+t[\ \}$ and $B_t \equiv B(0,t) =]-t, t[$, $t > 0$. Then

$$\mu_\alpha B_t = b_\alpha\, t^{2\alpha+2},$$

where $b_\alpha = \left[2^{\alpha+1}\,(\alpha+1)\,\Gamma(\alpha+1)\right]^{-1}$.

The operators τ_x, $x \in \mathbb{R}$, are called Dunkl translation operators on $\mathbb{R}$ and it can be expressed in the following form

$$\tau_x f(y) = c_\alpha \int_0^\pi f_e\left((x,y)_\theta\right)\, h_1(x,y,\theta)(\sin\theta)^{2\alpha}\, d\theta$$

$$+c_\alpha \int_0^\pi f_o\left((x,y)_\theta\right)\, h_2(x,y,\theta)(\sin\theta)^{2\alpha}\, d\theta,$$

where $(x,y)_\theta = \sqrt{x^2+y^2-2|xy|\cos\theta}$, $f = f_e + f_o$, f_o and f_e being respectively the odd and the even parts of f, with $c_\alpha \equiv \left(\int_0^\pi (\sin\theta)^{2\alpha}\, d\theta\right)^{-1} = \frac{\Gamma(\alpha+1)}{\sqrt{\pi}\,\Gamma(\alpha+1/2)}$, $h_1(x,y,\theta) = 1 - sgn(xy)\cos\theta$ and

$$h_2(x,y,\theta) = \begin{cases} \frac{(x+y)\,[1-sgn(xy)\cos\theta]}{(x,y)_\theta}, & \text{if } xy \neq 0, \\ 0, & \text{if } xy = 0. \end{cases}$$

Now we define the Dunkl-type maximal function by

$$M_\alpha f(x) = \sup_{r>0}\left(\mu_\alpha B_r\right)^{-1} \int_{B_r} \tau_x|f|(y)\, d\mu_\alpha(y), \quad 0 \le \beta < 2\alpha+2.$$

For a real parameter $\alpha \ge -1/2$, we consider the Dunkl operator, associated with the reflection group $\mathbb{Z}_2$ on $\mathbb{R}$:

$$\Lambda_\alpha(f)(x) = \frac{d}{dx}f(x) + \frac{2\alpha+1}{x}\left(\frac{f(x)-f(-x)}{2}\right)$$

Let $\omega(x,r)$ positive measurable weight function on $\mathbb{R}\times(0,\infty)$. The norm in the space $\mathcal{M}_{p,\omega,\alpha}(\mathbb{R})$ may be introduced in two forms,

$$\|f\|_{\mathcal{M}_{p,\omega,\alpha}}=\sup_{x\in\mathbb{R},\,t>0}\frac{t^{-\frac{2\alpha+2}{p}}}{\omega(x,t)}\|\tau_x|f|\|_{L_{p,\alpha}(B_t)}.$$

Theorem. *Let $1\le p<\infty$ and the $\omega(x,r)$ positive measurable weight function on $\mathbb{R}\times(0,\infty)$ satisfying the condition*

$$\int_r^\infty \omega(x,t)\frac{dt}{t}\le C\omega(x,r).$$

Then for $p>1$ the maximal operator M_α is bounded from $\mathcal{M}_{p,\omega,\alpha}(\mathbb{R})$ to $\mathcal{M}_{p,\omega,\alpha}(\mathbb{R})$ and for $p=1$ the maximal operator M_α is bounded from $\mathcal{M}_{1,\omega,\alpha}(\mathbb{R})$ to $W\mathcal{M}_{1,\omega,\alpha}(\mathbb{R})$.

Fourier Series on Banach Function Space

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Abstract

In 1876 P. du Bois-Reymond constructed a continuous function with a divergent Fourier series at a point, and extension of his work shows that the same is true for a dense set of points in , which however has Lebesgue measure zero. Then in 1915 Luzin conjectured that the Fourier series converges a.e. for each . In 1926 Kolmogorov showed that there exist whose Fourier series diverge a.e. Then in 1966 Carleson [1] .nally proved Luzin.s conjecture, namely that the Fourier series of every converges a.e. His proof was extended by Hunt [2] to cover all functions , . The concept of -strong Cesaro summability at a point in for an function from the main space is introduced. The concept of -statistical convergence at a point given by Bilalov B.T., Sadigova S.R. [3] is also considered and the relationship between these concepts is established. This approach is applied to the study of the convergence of a Fourier series from a weighted space .

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Keywords

Divergent Fourier Series,Dense Set,Lebesgue Measure

Hardy type integral inequalities involving many functions for $0 < p < 1$

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Abstract

It is well known the classical Hardy's inequality:

$$\int_0^\infty \Big(\frac{F(x)}{x}\Big)^p dx < \Big(\frac{p}{p-1}\Big)^p \int_0^\infty \Big(f(x)\Big)^p dx. \tag{14}$$

Where $F(x) = \int_a^x f(t)dt$, $p > 1$, f non negative measurable function. Our aim is to generalize the corresponding weighted inequality of (1) with $0 < p < 1$ for many functions.

Theorem 1 Let $f_1, f_2, ..., f_n$ n functions measurable and non negative, $0 < p < 1$.

1. If $-\frac{1}{p} < \alpha < 1 - \frac{1}{p}$ and for every $i = 1...n$ f_i is non increasing, then

$$\int_0^\infty \Big(x^{n\alpha}(Hf_1)(x)(Hf_2)(x)...(Hf_n)(x)\Big)^{\frac{p}{n}} dx \leq$$

$$\frac{1}{n^p}\Big(1 - \frac{1}{p} - \alpha\Big)^{-1} \int_0^\infty x^{\alpha p}\Big(f_1(x) + f_2(x) + ... + f_n(x)\Big)^p dx \tag{15}$$

2. If $\alpha < -\frac{1}{p}$ and for every $i = 1...n$ f_i is non decreasing, then

$$\int_0^\infty \Big(x^{n\alpha}(Hf_1)(x)(Hf_2)(x)...(Hf_n)(x)\Big)^{\frac{p}{n}} dx \leq$$

$$\frac{p}{n^p} B(p, -\alpha p) \int_0^\infty x^{\alpha p}\Big(f_1(x) + f_2(x) + ... + f_n(x)\Big)^p dx \tag{16}$$

3. If $\alpha > 1 - \frac{1}{p}$ and for every $i = 1...n$ f_i is non increasing, then

$$\int_0^\infty (x^{n\alpha}\Big(H^* f_1)(x)(H^* f_2)(x)...(H^* f_n)(x)\Big)^{\frac{p}{n}} dx \leq$$

$$\frac{p}{n^p} B(p, \alpha p + 1 - p) \int_0^\infty x^{\alpha p}\Big(f_1(x) + f_2(x) + ... + f_n(x)\Big)^p dx \tag{17}$$

where $B(u, v) = \int_0^1 x^{u-1}(1-x)^{v-1}dx$ is the Euler-Beta function and

$$(Hf)(x) = \frac{1}{x}\int_0^x f(y)dy, \qquad (H^* f)(x) = \frac{1}{x}\int_x^\infty f(y)dy.$$

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Keywords

Hardy type integral inequalities, many functions for $0 < p < 1$.

Apriori estimates of solutions higher order elliptic and parabolic equations of higher order in Morrey spaces.

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Abstract

In present work we is considering higher order elliptic and parabolic equations in Morrey spaces. Apriori estimates for solutiion Dirichlet problem is obtained.

Keywords

apriori estimates, Morrey spaces, requlrity

On The Square Functions Associated With The Bessel Differential Operator

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Abstract

The classical square functions play important role in Fourier Harmonic Anal-ysis and its applications. The relevant harmonic analysis, known as Fourier-Bessel harmonic analysis associated with the Bessel differential operator

$$B_t = \frac{d^2t}{dt^2} + \frac{(2\alpha+1)}{t}\frac{d}{dt}, \quad \alpha > -\frac{1}{2}, \quad t > 0$$

has been research area for many mathematicians such as B.M. Levitan, I.A. Kipriyanov, M.Klyuchantsev, L.Lyakhov, K.Stempak, A.D. Gadjiev, I.A.Aliev, V.S.Guliyev, A.Serbetci and others.

In this paper the square function generated by the Bessel differential operator is introduced and its $L_{2,\alpha}$-boundedness is obtained.

Keywords

Bessel translation, Generalized translation, Bessel transform, Bessel Plancherel formula, Generalized convolution, Bessel differential operator

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Transmutation theory and its applications

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Abstract

Dedicated to Professor Vagif Guliev's 60th birthday
and his prominent contribution to mathematics.

Methods of transmutation theory now form an important part of modern mathematics, cf. [1]–[5]. They have many applications to theoretical and applied problems. Let us just itemize some problems in the modern transmutation theory.

1. Theory of Buschman–Erdelyi transmutations [5]–[8]. This class of operators have many applications in partial differential equations, Radon transform theory and many other problems including deriving connection formulas for differential equations with singular coefficients.

2. Sonine–Dimovski and Poisson–Dimovski transmutations for hyper–Bessel functions and equations [2]–[3], Sonine and Poisson type transmutations for difference–differential operators of Dunkle type.

3. Applications of transmutations to generalized analytic function theory [4].

4. Methods of fractional integrodifferentiation and integral transforms with special function kernels. In this field let us note a composition method for construction many classes of transmutations [5]–[9].

5. Application of transmutations to differential equations with Bessel–type operators [5]–[11].

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Keywords

Transmutation operators, integral transforms, Bessel differential operator, special functions.

The solutions of stohastic differential equations connected with nonliear elliptic equations.

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Abstract

In paper we is considered the stohastic differential equations. We is studying solutions this equations connected with nonlinear elliptic equations.

Keywords

stohastic differential equations, nonlinear equation, elliptic

Riesz potential associated with Schrödinger operator on generalized Morrey spaces

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Abstract

Let $L = -\triangle + V$ be a Schrödinger operator, where the non-negative potential V belongs to the reverse Hölder class $RH_{n/2}$, and let $\mathcal{I}_\beta^L$ be the Riesz potential operator associated with L. In this abstract, we study the boundedness of the operator $\mathcal{I}_\beta^L$ on generalized Morrey spaces associated with Schrödinger operator $M_{p,\varphi}^{\alpha,V}$.

Keywords

Generalized Morrey spaces associated with Schrödinger operator; Riesz potential associated with Schrödinger operator

An Application on Local Property of Matrix Summability of Factored Fourier Series

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Abstract

In this paper, a known theorem dealing with absolute weighted arithmetic mean summa- bility factors of Fourier series is generalized to more general cases by taking normal matrices.

Keywords

Summability factors, absolute matrix summability, infinite series, Fourier series, Hölder inequality, Minkowski inequality, sequence space

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Boundedness of B-square functions

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Abstract

The classical square functions play important role in Harmonic analysis and have a very direct connections L_2-estimates and Littlewood- Paley theory. In this paper we consider the generalized shift operator associated with the Laplace-Bessel differential operator

$$\Delta_B = \sum_{k=1}^{n-1} \frac{\partial^2}{\partial x_k^2} + \Big(\frac{\partial^2}{\partial x_n^2} + \frac{2\nu}{x_n} \frac{\partial}{\partial x_n} \Big), \quad \nu > 0.$$

and the relavant square functions. We introduce $B-$ square functions and then prove boundedness of newly defined $B-$ square functions from $L_{p,\nu}(\mathbb{R}^n_+, H_1)$ to $L_{p,\nu}(\mathbb{R}^n_+)$, for all $1 \leq p < \infty$ and H_1 separable Hilbert space.

Keywords

Laplace-Bessel differential operator, generalized shift operator, vector-valued B-singular integral operators

Error Analysis of XDG Methods for Singularly Perturbed Problems

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Abstract

In this work, we study a new extended discontinuous finite element method to approximate solutions of partial differential equation problems that exhibit boundary layers. The rapid changes that occur in the layers require the mesh to be very fine and can render standard numerical techniques computationally expensive for this type of problem. To overcome this challenging behaviour, we propose an approach that has gained considerable popularity in the last decade and that enriches finite element approximations spaces with special functions that capture the difficult solution behaviour. Such analyses are provided in this work for the XdG method and applied to problems with boundary layers. Proofs are given showing the XdG approximations are more accurate than those from more standard finite element schemes. Uniform optimal error estimates in the energy norm and these error estimates are provided in terms of the degree of the polynomials used in the approximation and severity of the boundary layer. Computational results for this new method are presented and confirm the theoretical findings.

Keywords

Discontinuous finite element method, Extended Discontinuous Galerkin, Uniform convergence

A Finite Difference Methods For Fractional Differential Equations

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Abstract

A finite difference method is proposed for fractional order dfferential equations. We use the recently defined fractional derivative called conformable fractional derivative to drive these finite difference approximations and prove the stability and convergence of the proposed methods. We also prove the stability and convergence of the fractional Euler method. Error analyses are provided and some numerical examples are presented to support the theoretical analysis.

Keywords

Conformable Fractional Derivative, Finite Difference, Fractional Euler, Stability, Convergence

The some property of solutions degenerate nonlinear parabolic equations.

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Abstract

We is consider of solutions Dirichlet problem for degenerate nonlinear parabolic equations. The optimal requlority for solutions this problem is obtained. We also give removabibility theorem is termins of Hausdorf measure for solutions these problem.

Keywords

requlority, nonlinear equation, removability

Spectral stability estimates for the eigenvalues of a Dirichlet p-elliptic differential operator

To Giang

Abstract

Let Ω be an open subset in $\mathbb{R}^{\mathbb{N}}$. We consider the so-called p-elliptic operator:

$$L_p u := \sum_{i,j=1}^{N} \frac{\partial}{\partial x_i} \left[\left(\sum_{k,l=1}^{N} a_{kl}(x) \frac{\partial u}{\partial x_k} \frac{\partial u}{\partial x_l} \right)^{\frac{p-2}{p}} a_{ij}(x) \frac{\partial u}{\partial x_j} \right]$$

where $u \in W_0^{1,p}(\Omega)$, $a_{ij}(x) = a_{ji}(x)$ are continuously differentiable functions satisfying the following condition:

$$\theta_1 |\xi|^2 \leq \sum_{i,j=1}^{N} a_{ij}(x) \xi_i \xi_j \leq \theta_2 |\xi|^2$$

for some $\theta_1, \theta_2 > 0$, $\forall x \in \Omega$, $\forall \xi \in \mathbb{R}^{\mathbb{N}}$.

Notice that when $a_{ij}(x) = \delta_{ij}$, $L_p u = \Delta_p u = div(|\nabla u|^{p-2} \nabla u)$

For each open subset Ω in $\mathbb{R}^{\mathbb{N}}$ and each $n \in \mathbb{N}$ we define the following numbers:

$$\lambda_{p,n}[\Omega] := \inf_{M \in \mathfrak{M}_{p,n}(\Omega)} \sup_{u \in M} \frac{\int\limits_{\Omega} \left(\sum\limits_{i,j=1}^{N} a_{ij}(x) \frac{\partial u}{\partial x_i} \frac{\partial u}{\partial x_j} \right)^{\frac{p}{2}} dx}{\int\limits_{\Omega} |u|^p dx}$$

where $\mathfrak{M}_{p,n}(\Omega)$ is the family of those conic subsets M of $W_0^{1,p}(\Omega) \backslash \{0\}$, whose intersection with the unit sphere of $\mathrm{L}^p(\Omega)$ is compact in $W_0^{1,p}(\Omega)$ and whose Krasnoselskii's genus $\gamma(M)$ is greater than or equal to n. For $a_{ij}(x) = \delta_{ij}$, this formula becomes

$$\lambda_{p,n}[\Omega] := \inf_{M \in \mathfrak{M}_{p,n}(\Omega)} \sup_{u \in M} \frac{\int\limits_{\Omega} |\nabla u|^p dx}{\int\limits_{\Omega} |u|^p dx}$$

which represents the eigenvalues of the p-Laplacian $\Delta_p u = div(|\nabla u|^{p-2} \nabla u)$

For each open subset Ω of $\mathbb{R}^{\mathbb{N}}$ we consider the following class of functions: $\Phi(\Omega) = \{\phi = (\phi_1, \phi_2, ..., \phi_N) \in (L^{1,\infty}(\Omega))^N\}$: the continuous representative of ϕ is injective, $ess \inf\limits_{\Omega} |\det \nabla \phi| > 0\}$

where $\nabla_\phi = \left(\frac{\partial \phi_i}{\partial x_j}\right)_{i,j=1}^{N}$ is the Jacobian matrix and $L^{1,\infty}(\Omega)$ denotes the space of all functions in $L^1_{loc}(\Omega)$ whose weak derivatives of the first order are in $L^\infty(\Omega)$.

For every $L > 0$, let $\Phi_L(\Omega) = \{\phi \in \Phi(\Omega) : \||\nabla\phi|\|_{L^\infty(\Omega)} \leq L; ess \inf_\Omega |\det \nabla\phi| \geq L^{-1}\}$

Lemma. Let Ω be an open subset in $\mathbb{R}^{\mathbb{N}}$ of finite measure and $\phi \in \Phi(\Omega)$. Then for all $n \in \mathbb{N}$:

$$\lambda_{p,n}[\phi(\Omega)] := \inf_{M \in \mathfrak{M}_{p,n}(\Omega)} \sup_{u \in M} \frac{\int\limits_\Omega \left(\sum\limits_{k,l=1}^{N} A_{kl}(\phi) \frac{\partial u}{\partial x_k} \frac{\partial u}{\partial x_l}\right)^{\frac{p}{2}} |\det \nabla\phi| dx}{\int\limits_\Omega |u|^p |\det \nabla\phi| dx}$$

, where

$$A_{kl}(\phi) = \sum_{i,j=1}^{N} a_{ij}(\phi) b_{ki} b_{lj}$$

and

$$(\nabla\phi)^{-1} = \begin{pmatrix} b_{11} & ... & b_{1N} \\ ... & ... & ... \\ b_{N1} & ... & b_{NN}. \end{pmatrix}$$

Theorem. Let $p \in (2, \infty)$, Ω be an open subset in $\mathbb{R}^{\mathbb{N}}$ of finite measure and $\phi, \tilde{\phi} \in \Phi_L(\Omega)$. Then there exists $c > 0$ depending only on N, p, L such that the inequality

$$\left|\lambda_{p,n}[\phi(\Omega)] - \lambda_{p,n}[\tilde{\phi}(\Omega)]\right| \leq c \min\left\{\lambda_{p,n}[\phi(\Omega)], \lambda_{p,n}[\tilde{\phi}(\Omega)]\right\} . \left\|\phi - \tilde{\phi}\right\|_{W^{1,\infty}(\Omega)}$$

holds for all $n \in \mathbb{N}$ and all $\phi, \tilde{\phi} \in \Phi_L(\Omega)$ satisfying $\left\|\phi - \tilde{\phi}\right\|_{W^{1,\infty}(\Omega)} < c^{-1}$. For $a_{ij}(x) = \delta_{ij}$,this theorem was proved in [1].

References:

[1]. V.I. Burenkov, P.D. Lamberti, Spectral stability of the p-Laplacian, Nonlinear Analysis 71 (2009), 2227-2235.

On bases from cosines in Lebesgue spaces with variable summability index

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Abstract

In this work the perturbed system of cosines is considered. Under certain conditions on summability index $p(\cdot)$ and perturbation, the basicity of this system in Lebesgue spaces $L_{p(\cdot)}(0,\pi)$ with variable summability index $p(\cdot)$ is proved. The obtained results generalize similar results for the case $p(\cdot) = p = const.$ It should be noted earlier the basicity in generalized Lebesgue space of perturbed systems of exponents was considered in works [1],[2].

The following main theorem is proved.

Theorem. *Let* $1 < p^- \leq p^+ < +\infty$ *and* $\{\lambda_n;\, \mu_n\}_{n\in Z_+} \subset R$ *be some sequence of different numbers such that for some* $\alpha \in (1,\, p_0]$ *it holds*

$$\sum_{n=0}^{\infty} |\lambda_n - \mu_n|^{\alpha} < +\infty,$$

where $p_0 = \min\{2;\, p^-\}$. *If the system* $\{\cos \lambda_n x\}_{n\in Z_+}$ *forms a basis for* $L_{p(\cdot)}(0,\,\pi)$ *equivalent to the basis* $\{\cos nx\}_{n\in Z_+}$, *then the system* $\{\cos \mu_n x\}_{n\in Z_+}$ *also forms a basis for* $L_{p(\cdot)}(0,\,\pi)$ *equivalent to the basis* $\{\cos nx\}_{n\in Z_+}$.

[1] B.T. Bilalov, Z.G. Guseynov, *K-Bessel and K-Hilbert systems and K-bases*, Dokl. Math. 80(3) (2009), 826-828.

[2] T.R. Muradov, *On bases from perturbed system of exponents in Lebesgue spaces with variable summability exponent*, J. Inequal. Appl. 2014, 2014:495.

Keywords

Variable exponents Lebesgue spaces, cosine systems

Embeddings between weighted complementary local Morrey-type spaces and weighted local Morrey-type spaces

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Abstract

The aim of this talk is to give the characterization of the embeddings between weighted complementary local Morrey-type spaces and weighted local Morrey-type spaces. In particular, to present the optimal constant c in the inequality

$$\left(\int_0^\infty \left(\int_{B(0,t)} f(x)^{p_2} v_2(x)\,dx\right)^{\frac{q_2}{p_2}} u_2(t)\,dt\right)^{\frac{1}{q_2}} \le c\left(\int_0^\infty \left(\int_{\complement B(0,t)} f(x)^{p_1} v_1(x)\,dx\right)^{\frac{q_1}{p_1}} u_1(t)\,dt\right)^{\frac{1}{q_1}}$$

where p_1, p_2, q_1, $q_2 \in (0,\infty)$, $p_2 \le q_2$ and u_1, u_2 and v_1, v_2 are weights on $(0,\infty)$ and $\mathbb{R}^n$, respectively.

Keywords

Local Morrey-type spaces, Embeddings, Iterated Hardy Inequalities

Rough singular integral operators on generalized weighted Morrey spaces

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Abstract

Let $\Omega \in L_q(S^{n-1})$ be a homogeneous function of degree zero with $q > 1$ and have a mean value zero on S^{n-1}. In this abstract, we study the boundedness of the singular integral operators with rough kernels T_Ω and their commutators $[b, T_\Omega]$ on generalized weighted Morrey spaces $M_{p,\varphi}(w)$. We find the sufficient conditions on the pair (φ_1, φ_2) with $q' \leq p < \imath$, $p \neq 1$ and $w \in A_{p/q'}$ or $1 < p < q$ and $w^{1-p'} \in A_{p'/q'}$ which ensures the boundedness of the operators T_Ω from one generalized weighted Morrey space $M_{p,\varphi_1}(w)$ to another $M_{p,\varphi_2}(w)$ for $1 < p < \infty$., see [1].

[1] V.S. Guliyev, V.H. Hamzayev, *Rough singular integral operators and its commutators on generalized weighted Morrey spaces*, Mathematical Inequalities and Applications, 19 (3) (2016), 863-881.

Keywords

Singular integral operator, rough kernel, generalized weighted Morrey spaces.

Maximal and singular integral operators on generalized weighted Morrey spaces with variable exponent

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(Joint work with V.S. Guliyev)

Abstract

We consider the generalized weighted Morrey spaces $\mathcal{M}_{\omega}^{p(\cdot),\varphi}(\Omega)$, $\omega \in A_{p(\cdot)}(\Omega)$ with variable exponent $p(x)$ and a general function $\varphi(x,r)$ defining the Morrey-type norm. In case of unbounded sets $\Omega \subset \mathbb{R}^n$ we prove the boundedness of the Hardy-Littlewood maximal operator and Calderon-Zygmund singular operators with standard kernel, in such spaces.

Keywords

Maximal operator, singular integral operators, generalized weighted Morrey space with variable exponent

Fractional maximal operator on Heisenberg group on generalized Morrey spaces

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Abstract

Let $\mathbb{H}_n$ be the $2n+1$-dimensional Heisenberg group. That is, $\mathbb{H}_n = \mathbb{C}^n \times \mathbb{R}$, with multiplication

$$(z,t)\cdot(w,s) = (z+w, t+s+2Im(z\cdot\bar{w})),$$

where $z\cdot\bar{w} = \sum_{j=1}^{n} z_j\bar{w}_j$. The inverse element of $u=(z,t)$ is $u^{-1} = (-z,-t)$ and we write the identity of $\mathbb{H}_n$ as $0=(0,0)$. A homogeneous norm on $\mathbb{H}_n$ is given by $|(z,t)| = (|z|^2+|t|)^{1/2}$ and $B(u,r) = \{v\in\mathbb{H}_n : |u^{-1}v| < r\}$.

Let $\varphi(x,r)$ be a positive measurable function on $\mathbb{H}_n\times(0,\infty)$ and $1\le p<\infty$. We denote by $M_{p,\varphi}(\mathbb{H}_n)$ the generalized Morrey space, the space of all functions $f\in L_p^{\mathrm{loc}}(\mathbb{H}_n)$ with finite quasinorm

$$\|f\|_{M_{p,\varphi}(\mathbb{H}_n)} = \sup_{u\in\mathbb{H}_n, r>0} \varphi(u,r)^{-1}\,|B(u,r)|^{-\frac{1}{p}}\,\|f\|_{L_p(B(u,r))}.$$

We find the conditions on the pair (φ_1,φ_2) which ensures the boundedness of the fractional maximal operator M_α on $\mathbb{H}_n$ from one generalized Morrey space $\mathcal{M}_{p,\varphi_1}(\mathbb{H}_n)$ to another $\mathcal{M}_{p,\varphi_2}(\mathbb{H}_n)$, $1<p<\infty$, and from the space $\mathcal{M}_{1,\varphi_1}(\mathbb{H}_n)$ to the weak space $W\mathcal{M}_{1,\varphi_2}(\mathbb{H}_n)$.

Theorem 2 *Let $1\le p<\infty$, $0\le\alpha<\frac{Q}{p}$, $\frac{1}{p}-\frac{1}{q}=\frac{\alpha}{Q}$ and (φ_1,φ_2) satisfy the condition*

$$\sup_{r<t<\infty} t^{\alpha-\frac{Q}{p}} \operatorname*{ess\,inf}_{t<s<\infty} \varphi_1(u,s)s^{\frac{Q}{p}} \le C\,\varphi_2(u,r),$$

where C does not depend on u and r. Then the operator M_α is bounded from $M_{p,\varphi_1}(\mathbb{H}_n)$ to $M_{p,\varphi_2}(\mathbb{H}_n)$ for $p>1$ and from $M_{1,\varphi_1}(\mathbb{H}_n)$ to WM_{1,φ_2}.

Keywords

Fractional maximal operator; Heisenberg group; generalized Morrey spaces

Frequency Analysis Of Communication Faculty In Media Literancy Education

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Abstract

Information is transmitted from a multi-channel every day. The information covers all environmental media or by including it. The most obvious effect against the media, constitute the most vulnerable groups of young people, structure and functioning of the learning of the mass media, fictional media content in a conscious way reviews and critically monitor, so it is very important to be media literate. This supremely important in our country the concept of literacy shows the newly development will affect future generations. Media and communication in the age of communication can not be considered apart from each other in this area is essential to take an active role in communication. Therefore, communication and media literacy issues should be considered as nested with each other. In this study, final year students of the Faculty of Communication media to measure literacy levels and comparison with the final year students at other schools was based on several variables. Data collection method was the questionnaire, data collection tool was "Media Literacy Level Determination Scale" (Karaman 2009) and analysis was frequency analysis in SPSS program. The analysis results in the Faculty of Communication students have knowledge of media literacy levels compared to other faculty, it was determined that a higher level under the titles to be able to analyze and judge. Especially communication faculties of the students in the study of media literacy levels; have knowledge and be able to judge reached the conclusion that even higher in the category. Based on the obtained data communication faculty students can evaluate the direction of more efficient and effective media and literacy courses has made a suggestion.

Keywords

Media Literacy, Education, Faculty of Communication

Frequency Analysis Of The Confidence Level Of Communication Faculty In Context Of Media Literature

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Abstract

Since from the 20th century that has witnessed several changes and developments, systems reflecting these changes resulted in some self reflective initiatives through the use of their own products. One of these initiatives is media literacy described as the ability to access and evaluate the message in media in several forms. The intense effect of media on people through use of several media tools and channels necessitate the improvement of the ability to be conscious. According to conducted studies, creating a consciousness in media use of individuals that will help with evaluating the media message in the correct way through media literacy described as bringing up individuals engaging in critical thinking and analysis when evaluating media messages. Thus, it is important to study the the term media literacy and plan trainings accordingly. Therefore, the student's level of consciousness in terms of media literacy in faculty of communication seems vital. People who have education in the communication science are the only ones for a healthy transmission of this new term to others. In the study, media and information literacy awareness (Unesco, 2011) were evaluated by frequency analysis in the SPSS program through the example of communication faculty students. As a result of the study, it is shown that the students in faculty of communication have higher consciousness in terms of media literacy compared to other faculty students.

Keywords

Media Literacy, Education, Faculty of Communication

The strong convergence result of Mann-type iterative method in the Hilbert spaces

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Abstract

In this presentation, we considered a faster Mann iterative method that showed strong convergence to fixed point for Lipschitzian hemicontractive mappings in Hilbert spaces.

Keywords

Mann-type iterative scheme; Lipschitzian mappings; Hemicontractive mappings

Data dependence analysis for a new faster iteration method

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Abstract

In this work, we analyze the convergence and data dependence results for a new iteration method in hyperbolic space. Also, we prove that the new iteration method has better rate of convergence.

Keywords

Iteration method, convergence, data dependence

Some Questions of Harmonic Analysis in Weighted Morrey Type Spaces

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Abstract

Weighted Morrey-type classes of functions that are harmonic in the unit disk and in the upper half plane are defined in this work. Under some conditions on the weight function, we study some properties of functions belonging to these classes.

Keywords

Morrey-type classes, harmonic functions, Hardy-Littlewood operator, Minkowski inequality

Estimations of the norm of functions from Sobolev-Morrey type space, reduced by polynomials

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Abstract

In the abstract, the integral inequalities as estimation of the norms of functions reduced by polynomials, are proved, i.e. are proved type inequality

$$\|D^{\nu}(f-P_{l-1})\|_{q,G} \leq C\left|\widetilde{Q}(1)\right| \|f\|_{\omega^{l}_{p,\varphi,\beta}(G)}$$

and

$$\|D^{\nu}(f-P_{l-1})\|_{\omega^{l\prime}_{q}(G)} \leq C\left|\widetilde{Q_1}(1)\right| \|f\|_{\omega^{l}_{p,\varphi,\beta}(G)},$$

where $\nu=(\nu_1,...,\nu_n)$, $\nu_j \geq 0$ are integers $(j=1,2,...,n)$, P_{l-1} polynomial with $p-1$ degree.

The Sobolev-Morrey type space $W^{l}_{p,\varphi,\beta}(G)$ is understood as a space of locally summable on G functions having on f generalized derivatives $D^{l_i}_i f$ $(i=1,2,...,n)$ with the finite nome [1]

$$\|f\|_{W^{l}_{p,\varphi,\beta}(G)} = \|f\|_{L_{p,\varphi,\beta}(G)} + \|f\|_{\omega^{l}_{p,\varphi,\beta}(G)},$$

$$\|f\|_{L_{p,\varphi,\beta}(G)} = \sup_{x\in G, t>0}\left(\left|\varphi([t]_1)\right|^{-\beta}\|f\|_{p,G_{\varphi(t)}(x)}\right),$$

$$\|f\|_{\omega^{l}_{p,\varphi,\beta}(G)} = \sum_{i=1}^{n}\left\|D^{l_i}_i f\right\|_{L_{p,\varphi,\beta}(G)},$$

$$G_{\varphi(t)}(x) = G\cap\left\{y: |y_j-x_j| < \frac{1}{2}\varphi_j(t), j=1,2,...n\right\}$$

$l\in N^n; p\in[1,\infty)$; vector-functions $\varphi(t)=(\varphi_1(t),...,\varphi_n(t)), \varphi_j(t)>0$ $(t>0,\ j=1,2,...,n)$ by Lebesgue mesurable
$\lim\limits_{t\to+0}\varphi_j(t)=0$, $\lim\limits_{t\to+\infty}\varphi_j(t)=\infty$; $\left|\varphi([t]_1)\right|^{-\beta} = \prod\limits_{j=1}^{n}\left(\varphi_j([t]_1)\right)^{-\beta_j}, [t]_1=\min\{1,t\}, \beta_j\in[0,1], j=1,2,...n.$

1. Najafov A.M. The embedding theorems of space $W^{l}_{p,\varphi,\beta}(G)$, Math.Alferna, 3, 2013, No 4, p.299-308.

Keywords

integral inequalities, estimation, Sobolev-Morrey type space

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INTERNATIONAL CONFERENCE ON

" OPERATORS IN MORREY-TYPE SPACES AND APPLICATIONS"

DEDICATED TO 60th BIRTHDAY OF PROFESSOR VAGIF S. GULIYEV

T. C. KIRŞEHİR VALİLİĞİ

KURUKAHVECİ MEHMET EFENDİ Türk Kahvesi