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Generalized L-splines and the multi-point boundary value problem [Abstract of thesis]

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ABSTRACTS OF CSc. (Candidatus Scientiarum) THESES IN MATHEMATICS defended recently at Charles University, Prague

THE COERCIVITY OF ELLIPTIC SESQUILINEAR FORMS ON THE SOBOLEV SPACES $[W_2^{(s)}(\Omega)]^M$

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(19.12. 1986, supervisor J. Nečas)

In the presented work, the coercivity of elliptic bilinear forms is investigated on Sobolev spaces $[W_2^{(k-\theta)}(\Omega)]^M$ and $[W_2^{(k+\theta)}(\Omega)]^M$ ($|\theta| < \frac{1}{2}$) which correspond to the system of linear partial differential equations of the second order.

The bilinear form is uniformly elliptic and the coefficients fulfil some conditions of smoothness. Ω is a domain with Lipschitzian boundary. Under these assumptions it was shown, based upon the Lax-Milgram lemma, that the solution to the Dirichlet boundary value problem exists and is unique.

The work generalizes results proved in the work J. Nečas: Sur la coercivité des formes sesquilinéaires elliptiques, Rev. Math. Pures Appl. 9(1964), 47-69.

GENERALIZED L-SPLINES AND THE MULTI-POINT BOUNDARY VALUE PROBLEM

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In the dissertation, the problem of existence and convergence of splines is investigated. There are defined L_Λ-splines which are a generalization of L-splines with mixed boundary conditions. The word mixed means a linear combination of the values of the function and its derivatives at various points.

As a tool of investigation of the spline interpolation, the theory of N-point splines is used. The problem has been defined in such a way that the results may be used for the broadest classes of splines.

The realization method is as follows:

- and analysis of N-point problem by transforming it to a two-point boundary value problem for a system of linear differential equations;
- an exact answer was given to the question when the N-point problem is self-adjoint;
- simply verifiable conditions ensuring the existence and uniqueness of the solution, i.e. L_Λ-splines, were found.

The results are applied to some technical examples.

We have shown that classical splines of an odd degree and L-splines are special cases of L_Λ-splines defined in this work.

The results may also be applied to other multi-point boundary value problems.

ON A CLASS OF TORSIONFREE ABELIAN GROUPS

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The class of all purely finitely generated torsionfree Abelian groups was intensively studied in the last ten years (Butler groups). In the paper