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15. Numerical Analysis and Scientific Computing

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Finite difference schemes on nonuniform meshes.
Nonuniform meshes are often used for approximation of problems with generalized solutions. In this case, the order of local approximation is usually reduced. In many papers it is shown that the accuracy of the finite difference schemes can be increased using approximation of the considered differential equation in some non–mesh points. In this paper the convergence of such finite difference schemes is proved in discrete L_2 and W_2^1 norms assuming that the generalized solution of the considered boundary value problem belongs to the corresponding Sobolev space. Obtained convergence rate estimates are consistent with the smoothness of the solution of boundary value problem. Special attention is given to the multidimensional problems and to the problems with variable coefficients.