

Book review:

**METHODS OF NONLINEAR ANALYSIS. Applications
to Differential Equations**

by

Pavel Drábek, Jaroslav Milota

The book “Methods of Nonlinear Analysis, Applications to Differential Equations” by Pavel Drábek, Jaroslav Milota – the known Czech mathematicians – is devoted to methods of nonlinear analysis and their applications. In view of the fact that the real-world problems are in essence nonlinear, the methods of nonlinear analysis became important tools of modern mathematical modelling.

The book introduces fundamental methods of nonlinear analysis, explains them in a general framework, and illustrates on simple examples, typically on boundary value problems for elementary ordinary or partial differential equations.

The exposition of the material is at two levels: a self-contained basic level and an advanced level contained in several appendices.

The basic material includes in particular:

- main tools from linear algebra and linear functional analysis,
- compact operators, contraction principle,
- differential and integral calculus in normed linear spaces,
- inverse function theorem, implicit function theorem, rank theorem, local bifurcation theorem of Crandall and Rabinowitz,
- topological and monotonicity methods of nonlinear analysis, the Brouwer and Schauder fixed point theorems, the method of monotone iterations based on the notions of super- and sub-solutions,
- variational methods, method of Lagrange multipliers, the mountain pass theorem,
- applications of the presented methods to boundary value problems for elementary nonlinear partial differential equations.

Owing to a comprehensive presentation of a broad range of methods of nonlinear analysis with clear exposition of their applications to differential equations the book is a very valuable position in the field of applied mathematics.

Irena Pawłow

Pavel Drábek, Jaroslav Milota, *Methods of Nonlinear Analysis. Applications to Differential Equations*. Birkhäuser Verlag AG, Basel-Boston-Berlin, 2007, 568 pages, ISBN 13-978-3-8146-2. Price (hardcover): 69.90 EUR.