Editorial

Fixed Point Theorems with Applications to the Solvability of Operator Equations and Inclusions on Function Spaces

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Fixed point theory is an elegant mathematical theory which is a beautiful mixture of analysis, topology, and geometry. It is an interdisciplinary theory which provides powerful tools for the solvability of central problems in many areas of current interest in mathematics and other quantitative sciences, such as physics, engineering, biology, and economy. In fact, the existence of linear and nonlinear problems is frequently transformed into fixed point problems, for example, the existence of solutions to partial differential equations, the existence of solutions to integral equations, and the existence of periodic orbits in dynamical systems. This makes fixed point theory a topical area and a subject of active scientific research, constantly evolving and growing and in a perpetual progress.

Fixed point theory has two main branches: on one hand, we can consider the results obtained by using metric properties; on the other hand, we can consider the results deduced from topological properties. Among the classical results, which are the basis for the metric branch, we retain the Banach contraction principle in complete metric spaces established by Banach in 1922. With respect to the topology branch, the main theorems are those of Brouwer and his infinite dimensional version, the Schauder fixed point theorem, which were proved in 1912 and 1930, respectively. In both, the compactness plays an essential role. A hybrid result combining metric and topological properties was established by Krasnoselskii in 1955. This result is exciting and has a very wide scope. In recent years, a number of authors have

found this theorem a very satisfactory outcome for the study of stability and asymptotic behavior of solutions for certain differential equations which resisted the direct Lyapunov method.

The development of such fixed point theorems remains a constant concern for many investigators who have continued to enrich this field by new quite interesting contributions following constantly the progress of applications to fully meet the needs of this dynamic and active field. Thus, fixed point theorems were developed for single-valued and multivalued mappings on topological vector spaces, metric spaces, Banach spaces, Banach algebras, posets, lattices, Banach lattices, and so forth.

Due to the importance of fixed point theory and its applications, it is worthwhile to publish a special issue on this topic to highlight recent advances made by mathematicians actively working in this area.

This special issue was originally elaborated to report the latest advances in fixed point theory in abstract spaces and their applications. It includes works on single-valued and multivalued mappings in normed and metric spaces and various applications to boundary value problems, equilibrium problems, and variational inequalities.

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