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Recently, Farkas [1] discovered special vanishing properties for theta functions associated with surfaces which admit fixed-point free automorphisms of period two ... of square integrable automorphic ...

Advances in the Theory of Riemann Surfaces. (AM-66)

The aim of this book is to characterize certain multiplicative and additive arithmetical functions by combining methods from number theory with some simple ideas from functional and harmonic analysis.

This book presents the foundation of the theory of almost automorphic functions in abstract spaces and the theory of almost periodic functions in locally and non-locally convex spaces and their applications in differential equations. Since the publication of Almost automorphic and almost periodic functions in abstract spaces (Kluwer Academic/Plenum, 2001), there has been a surge of interest in the theory of almost automorphic functions and applications to evolution equations. Several generalizations have since been introduced in the literature, including the study of almost automorphic sequences, and the interplay between almost periodicity and almost automorphic has been exposed for the first time in light of operator theory, complex variable functions and harmonic analysis methods. As such, the time has come for a second edition to this work, which was one of the most cited books of the year 2001. This new edition clarifies and improves upon earlier materials, includes many relevant contributions and references in new and generalized concepts and methods, and answers the longtime open problem, "What is the number of almost automorphic functions that are not almost periodic in the sense of Bohr?" Open problems in non-locally convex valued almost periodic and almost automorphic functions are also indicated. As in the first edition, materials are presented in a simplified and rigorous way. Each chapter is concluded with bibliographical notes showing the original sources of the results and further reading.

Almost Automorphic and Almost Periodic Functions in Abstract Spaces introduces and develops the theory of almost automorphic vector-valued functions in Bochner's sense and the study of almost periodic functions in a locally convex space in a homogenous and unified manner. It also applies the results obtained to study almost automorphic solutions of abstract differential equations, expanding the core topics with a plethora of groundbreaking new results and applications. For the sake of clarity, and to spare the reader unnecessary technical hurdles, the concepts are studied using classical methods of functional analysis.

This book presents a comprehensive introduction to the concepts of almost periodicity, asymptotic almost periodicity, almost automorphy, asymptotic almost automorphy, pseudo-almost periodicity, and pseudo-almost automorphy as well as their recent generalizations. Some of the results presented are either new or else cannot be easily found in the mathematical literature. Despite the noticeable and rapid progress made on these important topics, the only standard references that currently exist on those new classes of functions and their applications are still scattered research articles. One of the main objectives of this book is to close that gap. The prerequisites for the book is the basic introductory course in real analysis. Depending on the background of the student, the book may be suitable for a beginning graduate and/or advanced undergraduate student. Moreover, it will be of a great interest to researchers in mathematics as well as in engineering, in physics, and related areas. Further, some parts of the book may be used for various

graduate and undergraduate courses.

This book discusses almost periodic and almost automorphic solutions to abstract integro-differential Volterra equations that are degenerate in time, and in particular equations whose solutions are governed by (degenerate) solution operator families with removable singularities at zero. It particularly covers abstract fractional equations and inclusions with multivalued linear operators as well as abstract fractional semilinear Cauchy problems.

This volume is devoted to the study of almost automorphic dynamics in differential equations. By making use of techniques from abstract topological dynamics, it is shown that almost automorphy, a notion which was introduced by S. Bochner in 1955, is essential and fundamental in the qualitative study of almost periodic differential equations. Fundamental notions from topological dynamics are introduced in the first part of the book. Harmonic properties of almost automorphic functions such as Fourier series and frequency module are studied. A module containment result is provided. In the second part, lifting dynamics of $\omega$-limit sets and minimal sets of a skew-product semiflow from an almost periodic minimal base flow are studied. Skew-product semiflows with (strongly) order preserving or monotone natures on fibers are given particular attention. It is proved that a linearly stable minimal set must be almost automorphic and become almost periodic if it is also uniformly stable. Other issues such as flow extensions and the existence of almost periodic global attractors, etc., are also studied. The third part of the book deals with dynamics of almost periodic differential equations. In this part, the general theory developed in the previous two parts is applied to study almost automorphic and almost periodic dynamics which are lifted from certain coefficient structures (e.g., almost automorphic or almost periodic) of differential equations. It is shown that (harmonic or subharmonic) almost automorphic solutions exist for a large class of almost periodic ordinary, parabolic and delay differential equations.

Systems of differential equations in Hilbert space with almost automorphic or almost periodic coefficients are discussed. Coalescing the techniques of Favard and Bochner, certain of their results are extended for finite-dimensional systems to the context above, and sufficient conditions are determined for almost automorphic or almost periodic solutions to exist. (Author).

Since the publication of our first book [80], there has been a real resiu-gence of interest in the study of almost automorphic functions and their applications ([16, 17, 28, 29, 30, 31, 32, 40, 41, 42, 46, 51, 58, 74, 75, 77, 78, 79]). New methods (method of invariant s- spaces, uniform spectrum), and new concepts (almost periodicity and almost automorphy in fuzzy settings) have been introduced in the literature. The range of applications include at present linear and nonlinear evolution equations, integro-differential and functional-differential equations, dynamical systems, etc...It has become imperative to take a bearing of the main steps of the the ory. That is the main purpose of this monograph. It is intended to inform the reader and pave the road to more research in the field. It is not a self contained book. In fact, [80] remains the basic reference and fimdamental source of information on these topics. Chapter 1 is an introductory one. However, it contains also some recent contributions to the theory of almost automorphic functions in abstract spaces. VIII Preface Chapter 2 is devoted to the existence of almost automorphic solutions to some Unear and nonUnear evolution equations. It con tains many new results. Chapter 3 introduces to almost periodicity in fuzzy settings with applications to differential equations in fuzzy settings. It is based on a work by B. Bede and S. G. Gal [40].

This research not presents recent results in the field of almost-periodicity. The emphasis is on the study of vector-valued almost-periodic functions and related classes, such as asymptotically almost-periodic or almost-automorphic functions. Many examples are given, and applications are indicated. The first three chapters form a self-contained introduction to the study of continuity, derivability and integration in locally convex or Banach spaces. The remainder of the book is devoted to almost-periodicity and related topics. The functions are defined on IR, IR[superscript n] or an abstract group; the range is a Banach or a Hilbert space. Although treatment of the material related to pure mathematics, the theory has many applications in the area of abstract differential equations.