# Contents

# The Mathematician Elena Popoviciu:
# Her life and work

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On June 24, 2009, a star has lapsed off the Romanian mathematics sky. Elena Popoviciu, the daughter of Ioan Moldovan and of his wife Rozalia, was born in Cluj on August 26, 1924. She graduated from the elementary school and university in her native town, standing out by her artistic talents in painting, music, literature, but excelling as a researcher in the field of mathematics. She married the academician Tiberiu Popoviciu in 1964, who she helped to build the prestige of the Cluj mathematical school, at the same time offering the academician a pleasant family environment, so much needed for a person involved in the academic creation.

**The university career**
After completing a bachelor's degree in mathematics in the summer of 1947, she started working as an instructor in a high school from Cluj-Napoca. In 1947 she moved to the university going through all stages

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# Existence Results for Stampacchia and Minty Type Generalized Variational Inequality Problems

Adela Elisabeta Capătă

(Cluj-Napoca)

Abstract. This paper deals with Stampacchia and Minty type generalized variational inequality problems, considered for vector functions and multifunctions. We state existence theorems for these variational inequalities, based on some recent existent results of the author for equilibrium problems.

## 1  Introduction

Vector variational inequality models arises from vector optimization and vector traffic equilibria (see [2]). The concept of vector variational inequality was introduced by Giannessi in [9]. Many properties of vector variational inequality have been studied in the literature (see [5] - [8]).

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# The median of the $n$-dimensional abstract tree

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ABSTRACT. By virtue of abstract cubes, defined in [5], a notion of an abstract
and metric cubic complex $\mathcal{K}^n$ is defined. Is studied the problem of a median for
a particular case of such a complex, defined as cubic abstract tree $T_d^n$, which
border is an abstract $(n-1)$-dimensional sphere $\sum^{n-1}$. A tree $T_d^n$ is modeled
in metric space $R_1^m$, where $m$ is a number of clases of 1-dimensional and parallel
cubes of the tree. It is proved that finding mediane of the $T_d^n$ does not depend
on metrics and is done on the image of the tree in m-dimensional cubic unit
$I^m$. The alghoritm of calculating the tree's mediane is desribed.

## 1. The $n$-dimensional abstract cubic complex.

In the context of studding the multi-ary relations complex (see [1],
[2] and [8]) theoretical and practical problems do appear. A special

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# On Fourier Coefficients of an Almost Periodic Function

Silvia-Otilia Corduneanu

(Iaşi)

ABSTRACT. Consider a Hausdorff $\sigma$-compact, locally compact abelian group $G$ and let $\lambda$ be the Haar measure on $G$. Using the Banach's Fixed Point Theorem and the properties of Fourier coefficients of an almost periodic function, we find a unique almost periodic solution for the equation

$$f(x) = \lim_{n \to \infty} \frac{1}{\lambda(H_n)} \int_{H_n} f(xy^{-1})g(y)d\lambda(y) + h(x), \quad x \in G.$$

In this context $g$ and $h$ are almost periodic functions on $G$ and $(H_n)_n$ is an increasing sequence of open, relatively compact subsets of $G$ such that $G = \bigcup_{n=1}^{\infty} H_n$ and for each $x \in G$,

$$\lim_{n \to \infty} \frac{\lambda(xH_n \Delta H_n)}{\lambda(H_n)} = 0.$$

KEY WORDS: Almost periodic function, Fourier coefficients, functional equation, Fourier series.

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# Improved Sequential Optimality Conditions for Vector Optimization Problems with Cone-Epi-Closed Functions

Anca Grad

(Cluj-Napoca)

ABSTRACT.  Sequential optimality conditions have lately triggered the interest of researchers in optimization due to the fact that they do not require the fulfillment of any other constraint qualification, which is the case when working with other types of optimality conditions. In this the article we provide such conditions for quite a general class of vector optimization problems, where the functions considered are cone-convex and cone-epi-closed, improving thus the work previously done with this respect in [2] and [3]. We use the sequential results for convex programming obtained in [4].  Two particular cases: the linear scalarization and the set-scalarization, are further discussed.

KEY WORDS: convex vector optimization, scalarization, properly and weakly efficient solutions, sequential optimality conditions

MSC 2000:   90C25, 90C29, 90C46, 49K99

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# Local Lexicographical Maximal Vertices in a Hyperbolical Multi-criteria Optimization Problem

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Abstract. In this paper, the property of local lexicographic maximality for a problem of multi-criteria optimization for which the objective function is of hyperbolic type is studied.

## 1    Introduction

Let $m$, $n$ and $p$ be nonzero natural numbers with $n > m$, $c_{h0}, d_{h0}, e_{h0}$, $h \in \{1, \ldots, p\}$ real numbers and let $b = (b_1, \ldots, b_m) \in \mathbb{R}^m$, $A = [a_{ij}] \in \mathbb{R}^{m \times n}$, $C = [c_{hj}] \in \mathbb{R}^{p \times n}$, $D = [d_{hj}] \in \mathbb{R}^{p \times n}$, $E = [e_{hj}] \in \mathbb{R}^{p \times n}$.

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# Exponential Dichotomy for Skew-Evolution Semiflows on Banach Spaces

Mihail  Megan      Codruţa  Stoica
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Abstract.  The paper presents the notion of exponential dichotomy in the case of skew-evolution semiflows in Banach spaces. Some characterizations in the nonuniform setting are given.

## 1   Definitions. Examples

The concept of skew-evolution semiflow proved itself to be an interesting generalization for evolution operators and skew-product semiflows. We can remark that, as a skew-evolution semiflow depends on

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# The Linear Transportation Problems Solved by Nomographical Procedures

Maria Mihoc

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Abstract. This paper studies the nomographical procedures for the solving linear of transportation problems (LT-model). For such types of problems the $n$-dimensional nomogram and the chained compound nomogram are used. The suggested model is illustrated in a concrete case of LT-model.

Key Words: nomogram, nomographical representation, $n$-dimensional nomogram, linear transportation problem

MSC 2000: 65S05

## 1 Introduction

For the linear programming problems and also for linear transportation problems, both the simplex algorithm elaborated by Danzig and many other or improvements of it, have been employed.

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# Positive linear operators preserving linear functions

Ioan Raşa
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ABSTRACT. We investigate some properties of the positive linear operators on $C[0,1]$ which preserve the linear functions. The behaviour with respect to the polynomials of second degree is also considered.

KEY WORDS: Positive linear operators, linear functions
MSC 2000: 41A36

## 1    Introduction

Positive linear operators which preserve the linear functions are very useful in Approximation Theory. Their properties were investigated from several points of view. Here we are interested in:
- the endpoints interpolation property;
- the behaviour with respect to the polynomials of second degree;
- the behaviour with respect to the convex functions;
- the second moment of the operators.

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# Exponential Stability for Stochastic Cocycle

Diana Stoica

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ABSTRACT. This paper presents the uniform exponential stability property for stochastic cocycles over an stochastic semiflow, which is generated by Wiener shift. There are presented several general characterizations of this asymptotic property out of which can be deduced well known results of the stability theory.

KEY WORDS: Stochastic semiflow, stochastic cocycles, exponential stability

MSC 2000: Primary 60H10, 60H15; Secundary 60H20

## 1  Introduction

The problem of existence of stochastic semiflows for semilinear stochastic evolution equation is a non-trivial one, mainly due to the well-established fact that finite-dimensional methods for constructing (even continuous) stochastic flow break down in the infinite-dimensional setting of semilinear stochastic evolution equations (see [2],[8]). For linear semilinear stochastic evolution equation with finite-dimensional noise, a stochastic semiflow (i.e. random evolution operator) was obtained in [1].

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# Some Remarks on the High Order Convexity of Tiberiu Popoviciu Type for Functions of Several Variables

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*This paper is dedicated to the memory of
professor dr doc Elena Popoviciu*

Abstract.  The goal of this paper is to introduce the notion of higher order convexity for functions of several real variables. Thus, a real function defined on a convex set from m-dimensional Euclidean space is said to be convex (quasi-convex) of higher order if for any lexicographic oriented segment its restriction to this segment is convex of higher order (quasi-convex of higher order). Several properties of these classes of generalized convex functions are also presented.

Key Words: high order convexity, high order quasi-convexity, lexico-graphic convexity

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# A Hierarchy of Logarithmic Convexity of Functions

GHEORGHE TOADER      SILVIA TOADER
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ABSTRACT. In what follows, a hierarchy of logarithmic $(h, m)$ - convexity is considered: we define logarithmic $(h, m)$ - starshaped functions, logarithmic $(h, m)$ - superadditive functions, Jensen logarithmic $(h, m)$ - convex functions, Jensen logarithmic $(h, m)$ - superadditive functions. Some inclusions between such classes of functions are established.

KEY WORDS: hierarchy of logarithmic $(h, m)$ - convexity of functions.
MSC 2000: 26A51

## 1 Introduction

Let us consider the sets of continuous, convex, starshaped, and superadditive functions on $[a, b]$ given by:

$$C[a, b] = \{f : [a, b] \longrightarrow \mathbb{R}, f \quad \text{continuous}\},$$

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# Computing Peano Kernels in Maple

Maria Gabriela Trîmbiţaş       Radu Trîmbiţaş
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ABSTRACT. We study here the possibility to compute univariate and bivariate Peano kernels in Maple.

KEY WORDS: Peano Theorem, Peano kernel, Maple

## 1   Introduction

Peano's theorem and its multivariate generalizations are strong devices for error estimation in Numerical Analysis.

Let $\mathbb{P}^2_{m-1}$ be the space of bivariate polynomial of degree at most $m-1$, and $B_{pq}(a,c)$ a Sard space (for a definition see [4],[5]).

**Theorem 1.1** *(see [5]) Let $L : H^m[a,b] \to \mathbb{R}$ a linear functional that commutes to the integral operator $\int_a^b$ (i.e. $L\int_a^b = \int_a^b L$). If $Ker(L) =$*

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# Mathematical Models of the Leukemic Hematopoiesis

Andrei Cucuianu     Radu Precup
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Abstract. Starting from a classification of acute myeloid leukemias which takes into account the vital characteristics of the leukemic clones, we present several mathematical models for the understanding of the origin and the dynamic of these diseases and for providing a theoretical basis of more adapted therapeutic approaches.

Key Words: Hematopoiesis, Acute myeloid leukemia, Dynamic system, Numerical simulation

MSC 2000:  92C50, 34A34

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# On the Geometry of a Thin Porous Plate

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ABSTRACT. Numerical results concerning the convexity of the median surface of an elastic, thin, porous plate are obtained. The components of the small deformations tensor is showed that represents the curvatures in the directions of the coordinate axes as well as the torsion of the plate. The slopes in the directions of the coordinate axes are numerically modeled. For a magnesium plate, it is proved that the curvature touches its maximum value (when the plate reaches its thermal equillibrium). The numerical results are obtained with FreeFem++.

KEY WORDS: porous plates; thermal stresses.

MSC 2000:   35J20, 37K05, 74A10, 74A15, 74A35

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# Considerations about the Tendencies of Some Climatic and Hydrological Parameters in the Upper Basin of Bârlad River

Roxana Hobai

(Iaşi)

Abstract. In this paper it is investigated the trend of the annual mean air temperature, annual amount of precipitation and annual mean liquid discharge in the upper basin of Bârlad river (eastern Romania) during the 1964-2007 period. The aim of this paper is to analyse through statistical procedures the tendency of these parameters in order to find the most appropriate expression of their interannual evolution. The polynomial trend model and the cumulative curve of the standardized anomaly are used to emphasize the idea that a micro-oscillation is more proper than a linear trend. The microcycle identified in this paper is connected with the natural variability of the hydro-climate which is also influenced by the anthropical interventions on the environment.

Key Words: polynomial trend, standardized anomaly

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# The Natural Anticancer Agent Cucurbitacin Inhibits Specifically the Stem Cell Factor Binding to its Receptor, c-Kit

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ABSTRACT. A computational study of the stem cell factor (SCF) and potential ligands was carried out starting with a crystallographic model deposited in the protein data bank. The inhibition of the SCF dimerization equilibrium was considered as the rationale for the identification of a specific inhibitor of SCF- Kit signaling pathway, obtained from NCI molecular database (USA), cucurbitacin. A molecular dynamics characterization of the SCF dimer allowed

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# A Mathematical model of comets in single cell gel electrophoresis technic for evaluation of DNA damage

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Mircea Rusu     Gavril Saplacan
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Abstract. Comet assay is continuously increasing its applicability from toxicology to oncology, cardiology, etc. The presented graphical evaluation of comets resulted from the method known as "comet assay" (used in Radiobiology Lab of Oncology Institute "Ion Kiricutza" Cluj) is based on two hypotheses. Firstly, for a given cell, the whole quantity of DNA remains constant for any type of damaging agent such as radiation or medication. Secondly, the nucleus

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