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**Mathematics**

**DIRECT LIMIT OF MATRIX-RINGS MAY BE UNITAL**

**Sorin LUGOJAN**

**Abstract.** Although the matrix-rings  $M(m; R)$  ( $R$  is a unital commutative ring) are unital rings, yet their classical direct limit is a non-unital ring. It is presented a direct system of matrix-rings that has a unital ring as a direct limit.

*Keywords and phrases:* block-diagonal matrix, direct limit, direct system, matrix-ring.

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**SOME NEW REMARKS ON THE FALKNER-SKAN EQUATION:  
STABILIZATION, INSTABILITY AND LAX FORMULATION**

**Camelia PETRIȘOR, Remus-Daniel ENE**

**Abstract.** In this paper we study the Falkner-Skan equation. Some stability problems, Lax formulation and an approximate analytic solution by means of the Optimal Homotopy Asymptotic Method (OHAM) were discussed.

*Keywords and phrases:* stability, Lax formulation, optimal homotopy asymptotic method (OHAM), nonlinear differential system.

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# CONNECTIONS BETWEEN SOME CONCEPTS OF POLYNOMIAL TRICHOTOMY FOR DISCRETE SKEW-EVOLUTION SEMIFLOWS IN BANACH SPACES

**Diana BORLEA**

**Abstract.** The present paper studies the property of trichotomy described by a polynomial behaviour according to decay, expansion and growth of the solution on the stable, unstable and central manifold respectively.

*Keywords and phrases:* skew-evolution semi-flow; polynomial trichotomy, strong polynomial trichotomy and weak polynomial trichotomy.

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## ON UNIFORM POLYNOMIAL DICHOTOMY IN BANACH SPACES

**Rovana BORUGA, Mihail MEGAN**

**Abstract.** The main objective of the present paper is to describe the polynomial dichotomy behaviour in the uniform case of evolution operators in Banach spaces. In this sense we generalize the uniform polynomial stability notion by giving necessary and sufficient conditions for the dichotomy concept.

*Keywords and phrases:* evolution operator, uniform polynomial dichotomy.

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## SOLVING FRACTIONAL ORDINARY DIFFERENTIAL EQUATION USING PLSM

**Mădălina - Sofia PAȘCA, Marioara LĂPĂDAT**

**Abstract.** In this paper, we obtaining analytical approximate solutions for fractional ordinary differential equations using *Polynomial Least Square Method* (PLSM). An example is illustrated to show the presented methods efficiency and convenience.

*Keywords and phrases:* Fractional ordinary differential equations, Polynomial Least Square Method (PLSM), Caputos fractional derivative.

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# LYAPUNOV FUNCTIONALS FOR SKEW-EVOLUTION SEMIFLOWS IN BANACH SPACES

**Claudia - Luminița MIHIT**

**Abstract.** The paper considers a notion of nonuniform splitting with growth rates for skew-evolution semiflows in Banach spaces. Characterizations for this concept are given through Lyapunov functionals with invariant and strongly invariant families of projections.

*Keywords and phrases:* Lyapunov functionals, skew-evolution semiflows, splitting.

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## A NEW APPROACH OF REFRACTION FOR 3D ELECTRIC FIELD IN NONLINEAR DIELECTRICS WITH PERMANENT POLARIZATION AND RANDOM ANISOTROPY

**Part III. Applications of the new refraction theorems, for particular cases**

**Ioan BERE**

**Abstract.** Using a new permittivity - defined by author (in Part I) for dielectrics with permanent polarization we will demonstrate new theorems of refraction (in Part II), more general, for three-dimensional (3D) electric field lines at the separation surface of two nonlinear and anisotropic materials with permanent polarization, which have random polarization main directions. Then (in Part three), some applications of the new refraction theorems are presented, for particular cases.

*Keywords and phrases:* a new permittivity, permanent polarization, random anisotropy, 3D refraction theorems.

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