math:differential equation phase diagrams

January 8, 2024

1 Direct products, varieties, and compactness conditions

M. Shahryari, A. N. Shevlyakov

Metadata

ID: http://arxiv.org/abs/1703.03143v1
UPDATED: 2017-03-09T05:46:41Z
PUBLISHED: 2017-03-09T05:46:41Z
math.RA ::

Summary

We study equationally Noetherian varieties of groups, rings and monoids. Moreover, we describe equationally Noetherian direct powers for these algebraic structures.

---

2 Analysis and Comparison of Large Time Front Speeds in Turbulent Combustion Models

Jack Xin, Yifeng Yu

Metadata

ID: http://arxiv.org/abs/1105.5607v1
UPDATED: 2011-05-27T16:36:40Z
PUBLISHED: 2011-05-27T16:36:40Z
math.AP :: 42 pages

Summary

Predicting turbulent flame speed (the large time front speed) is a fundamental problem in turbulent combustion theory. Several models have been proposed to study the turbulent flame speed, such as the G-equations, the F-equations (Majda-Souganidis model) and reaction-diffusion-advection (RDA) equations. In the first part of this paper, we show that flow induced strain reduces front speeds of G-equations in periodic compressible and shear flows. The F-equations arise in asymptotic analysis of reaction-diffusion-advection equations and are quadratically nonlinear analogues of the G-equations. In the second part of the paper, we compare asymptotic growth rates of the turbulent flame speeds from the G-equations, the F-equations and the RDA equations in the large amplitude (A) regime of spatially periodic flows. The F and G equations share the same asymptotic front speed growth rate; in particular, the same sublinear growth law $\frac{A}{\log(A)}$ holds in cellular flows. Moreover, in two space dimensions, if one of these three models (G-equation, F-equation and the RDA equation) predicts the bending effect (sublinear growth in the large flow), so will the other two. The nonoccurrence of speed bending is characterized by the existence of periodic orbits on the torus and the property of their rotation vectors in the advective flow fields. The cat's eye flow is discussed as a typical example of directional dependence of the front speed bending. The large time front speeds of the viscous F-equation have the same growth rate as those of the inviscid F and G-equations in two dimensional periodic incompressible flows.

---

3 Critical temperatures for superconducting phase-coherence and condensation in La2-xSrxCuO4

N. Coton, M. V. Ramallo, F. Vidal

Metadata

ID: http://arxiv.org/abs/1309.5910v3
UPDATED: 2013-10-25T16:44:29Z
PUBLISHED: 2013-09-23T19:00:31Z
cond-mat.supr-con :: main text (4pages, 4figs) + supplementary information (12pages, 8figs); pdfLaTeX; 1 TeX file + 12 PDF files for figures

Summary

A pivotal ongoing debate about cuprate superconductors (HTS) is the location of the transition temperatures for the superconducting wave function phase coherence and condensation, Tphase and Tcond. This shall elucidate which of two very different interactions dictate the macroscopic superconducting phase diagram of HTS: either those between normal-state carriers or those between preformed vortices and antivortices. Here, we present unambiguous experimental determinations of Tphase and Tcond in the prototypical HTS La2-xSrxCuO4 as a function of the doping level x. Tphase is measured as a sharp change in the exponent alpha of the voltage-current characteristics (V proportional to $I^{a}lpha$). $Tcondisdeterminedfromthecriticalroundingoftheohmicresistiv$ $antivortexbindingandalsothat, forallx, Tcondliesonlyafew Kelvinabove Tphase, limitingthentheshiftofthetransitionduetovortex-$ $antivortexcorrelations.$

---

4 On the equationally Artinian groups

M. Shahryari, J. Tayyebi

Metadata

ID: http://arxiv.org/abs/1803.04681v1
UPDATED: 2018-03-13T08:42:33Z
PUBLISHED: 2018-03-13T08:42:33Z
math.GR :: 10 pages

Summary

In this article, we study the property of being equationally Artinian in groups. We prove that a finite extension of an equationally Artinian group is again equationally Artinian. We also show that a quotient of an equationally Artinian group of the form $G[t]$ by a normal subgroup which is a finite union of radicals, is again equationally Artnian. This provides a large class of examples of equationally Artinian groups.

---

5 Equationally Noetherian property of Ershov algebras

Yuriy Dvorzhetskiy

Metadata

ID: http://arxiv.org/abs/1405.0954v1
UPDATED: 2014-05-05T16:41:09Z
PUBLISHED: 2014-05-05T16:41:09Z
math.RA ::

Summary

This article is about equationally Noetherian and weak equationally Noetherian property of Ershov algebras. Here we show two canonical forms of the system of equations over Ershov algebras and two criteria of equationally Noetherian and weak equationally Noetherian properties.

---

6 Restricted Boltzmann Machine, recent advances and mean-field theory

Aurélien Decelle, Cyril Furtlehner

Metadata

ID: http://arxiv.org/abs/2011.11307v2
UPDATED: 2021-05-28T08:32:54Z
PUBLISHED: 2020-11-23T10:08:53Z
cond-mat.dis-nn :: 44 pages, 13 figures. Accepted for CPB

Summary

This review deals with Restricted Boltzmann Machine (RBM) under the light of statistical physics. The RBM is a classical family of Machine learning (ML) models which played a central role in the development of deep learning. Viewing it as a Spin Glass model and exhibiting various links with other models of statistical physics, we gather recent results dealing with mean-field theory in this context. First the functioning of the RBM can be analyzed via the phase diagrams obtained for various statistical ensembles of RBM leading in particular to identify a *compositional phase* where a small number of features or modes are combined to form complex patterns. Then we discuss recent works either able to devise mean-field based learning algorithms; either able to reproduce generic aspects of the learning process from some *ensemble dynamics equations* or/and from linear stability arguments.

---

7 Solutions of the tt*-equations constructed from the $SU(2)_k$-fusion ring, and Smyth potentials

Tadashi Udagawa

Metadata

ID: http://arxiv.org/abs/2311.02353v1
UPDATED: 2023-11-04T09:15:11Z
PUBLISHED: 2023-11-04T09:15:11Z
math-ph :: 21 pages

Summary

Cecotti and Vafa introduced the tt*-equation (topological-antitopological fusion equation), whose solutions describe massive deformations of supersymmetric conformal field theories. We describe some solutions of the tt*-equation constructed from the $SU(2)_k$-fusion algebra. The idea of the construction is due to Cecotti and Vafa, but we give a precise mathematical formulation and a description of the "holomorphic data" corresponding to the solutions by using the DPW method. Furthermore, we give a relation between the solutions and the representations of SU(2). As a special case, we consider the solutions corresponding to the supersymmetric A_k-minimal model.

---

8 Phase Diagram for Nflation

Iftikhar Ahmad, Yun-Song Piao, Cong-Feng Qiao

Metadata

ID: http://arxiv.org/abs/0809.3333v2
UPDATED: 2009-03-28T03:01:04Z

PUBLISHED: 2008-09-19T09:16:27Z
hep-th :: 4 pages, 1 eps figure, contents extended, published version

Summary

Recently, it was showed that there is a large N phase transition in Nflation, in which when the number of fields is large enough, the slow roll inflation phase will disappear. In this brief report, we illustrate the phase diagram for Nflation, and discuss the entropy bound and some relevant results. It is found that near the critical point the number of fields saturates dS entropy.

---

9 Multiscale functions, Scale dynamics and Applications to partial differential equations

Jacky Cresson, Frédéric Pierret

Metadata

ID: http://arxiv.org/abs/1509.01048v1
UPDATED: 2015-09-03T12:05:26Z
PUBLISHED: 2015-09-03T12:05:26Z
math-ph ::

Summary

Modeling phenomena from experimental data, always begin with a *choice of hypothesis* on the observed dynamics such as *determinism*, *randomness*, *derivability* etc. Depending on these choices, different behaviors can be observed. The natural question associated to the modeling problem is the following : *"With a finite set of data concerning a phenomenon, can we recover its underlying nature ?* From this problem, we introduce in this paper the definition of *multi-scale functions*, *scale calculus* and *scale dynamics* based on the *time-scale calculus* (see [**?**]). These definitions will be illustrated on the *multi-scale Okamoto's functions*. The introduced formalism explains why there exists different continuous models associated to an equation with different *scale regimes* whereas the equation is *scale invariant*. A typical example of such an equation, is the *Euler-Lagrange equation* and particularly the *Newton's equation* which will be discussed. Notably, we obtain a *non-linear diffusion equation* via the *scale Newton's equation* and also the *non-linear Schrödinger equation* via the *scale Newton's equation*. Under special assumptions, we recover the classical *diffusion* equation and the *Schrödinger equation*.

---

10 Representations via differential algebras and equationally Noetherian algebras

Alexander A. Mikhalev, Manat Mustafa, Ualbai Umirbaev

Metadata

ID: http://arxiv.org/abs/2301.06693v1
UPDATED: 2023-01-17T04:15:22Z
PUBLISHED: 2023-01-17T04:15:22Z
math.RA :: 14 pages

Summary

We show that free algebras of the variety of algebras generated by the Witt algebra W_n, the left-symmetric Witt algebra L_n, and the symplectic Poisson algebra P_n can be described as subalgebras of differential polynomial algebras with respect to appropriately defined products. Using these representations, we prove that W_n, L_n, P_n, and the free algebras of the varieties of algebras generated by these algebras are equationally Noetherian.
