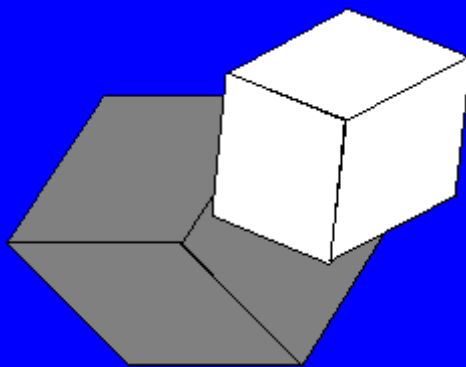


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## Papers Abstracts



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# The ranks of classes and $nX$ -complementary generations of the Tits group ${}^2F_4(2)'$

Ayoub B. M. Basheer, Malebogo J. Motalane, Mahlare G. Sehoana, Thekiso T. Seretlo

Let  $G$  be a finite non-abelian simple group. The *rank* of non-trivial conjugacy class  $X$  of  $G$ , denoted by  $\text{rank}(G:X)$ , is defined to be the minimal number of elements of  $X$  generating  $G$ . Also, a group  $G$  is said to be  $nX$ -complementary generated if given an arbitrary non-identity element  $x \in G$  then there exists an element  $y \in nX$  such that  $G = \langle x, y \rangle$ . In this paper we establish the ranks of all the conjugacy classes of the Tits group  ${}^2F_4(2)'$  and also classify all the non-trivial conjugacy classes of  ${}^2F_4(2)'$  whether they are complementary generators of  ${}^2F_4(2)'$  or not. (pp. 1–17)

# Inequalities of DVT-type – the two-dimensional case continued

Barbora Batíková, Tomáš J. Kepka, Petr C. Němec

In this note, particular two-dimensional inequalities dealing with two  $n$ -tuples of integer numbers under relatively general assumptions are investigated. Moreover, systems of integers for which the equality holds are completely described. (pp. 18–23)

# Automorphisms and isomorphisms of heptavalent symmetric graphs of order $32p$

Bo Deng, Song-Tao Guo

A graph is symmetric if its automorphism group acts transitively on the set of arcs of the graph. In this paper, we determine the automorphisms and isomorphisms of connected heptavalent symmetric graphs of order  $32p$  for each prime  $p$ . As a result, we get the complete classification of such graphs, and there are two sporadic such graphs with  $p = 2$  and  $3$ . (pp. 24–38)

# L-mosaics and orthomodular lattices

Nicolò Cangiotti, Alessandro Linzi, Enrico Talotti

In this paper, we introduce a class of hypercompositional structures called dualizable L-mosaics. We prove that their category is equivalent to that formed by ortholattices and we formulate an algebraic property characterizing orthomodularity, suggesting possible applications to quantum logic. To achieve this, we establish an equivalence between the category of bounded join-semilattices and that of L-mosaics, thereby providing a categorical foundation for our framework. (pp. 39–55)

### Existence and approximate controllability for random functional differential equations with finite delay

Tharmalingam Gunasekar, Srinivasan Madhumitha, Prabakaran Raghavendran, Murugan Suba

This study examines second-order equations with delays, which frequently arise in various scientific and engineering applications. Within Banach spaces, these equations introduce unique challenges and opportunities for analysis and control. By exploring the existence and approximate controllability of solutions, the research enhances the understanding of dynamical systems with delayed feedback. Using mathematical tools such as cosine family theory and the Leray-Schauder theorem, it establishes rigorous conditions for solution existence, contributing to both theoretical and practical advancements. Additionally, the study incorporates empirical validation through a practical example, offering insights into the real-world behavior of these equations. This empirical analysis bridges the gap between theory and application, supporting the development of effective control strategies and engineering solutions. Ultimately, this research deepens the understanding of complex dynamical systems with delays and provides valuable contributions to both theoretical progress and practical implementation.

(pp. 56–77)

### On intuitionistic $Q$ -fuzzy subalgebras/ideals/deductive systems in Hilbert algebras

Aiyared Iampan, V. Suganya, P. Gomathi Sundari, Neelamegarajan Rajesh

This study introduces the concepts of intuitionistic  $Q$ -fuzzy subalgebras, ideals, and deductive systems in the setting of Hilbert algebras and investigates their fundamental properties and interrelations. The theoretical results are supported by concrete examples and are structured in a way that facilitates understanding of the algebraic-logical framework underlying fuzzy logic extensions. By presenting clear definitions, illustrative cases, and step-by-step reasoning, the paper serves not only as a contribution to the field of abstract algebra but also as a useful learning resource for upper secondary science students beginning to engage with research. The work encourages early exploration of mathematical structures, fosters critical and creative thinking, and promotes accessibility of advanced topics through collaboration across academic levels and institutions.

(pp. 78–91)

### Some properties of the zero-set intersection graph of $C(X)$ and its line graph

Yangersenba T Jamir, Sanghita Dutta

Let  $C(X)$  be the ring of all continuous real valued functions defined on a completely regular Hausdorff topological space  $X$ . The zero-set intersection graph  $\Gamma(C(X))$  of  $C(X)$  is a simple graph with vertex set all non units of  $C(X)$  and two vertices are adjacent if the intersection of the zero sets of the functions is non empty. In this paper, we study the zero-set intersection graph of  $C(X)$  and its line graph. We show that if  $X$  has more than two points, then these graphs are connected with diameter and radius 2. We show that the girth of the graph is 3 and the graphs are both triangulated and hypertriangulated. We find the domination number of these graphs and finally we prove that  $C(X)$  is a von Neumann regular ring if and only if  $C(X)$  is an almost regular ring and for all  $f \in V(\Gamma(C(X)))$  there exists  $g \in V(\Gamma(C(X)))$  such that  $Z(f) \cap Z(g) = \emptyset$  and  $\{f, g\}$  dominates  $\Gamma(C(X))$ . Finally, we derive some properties of the line graph of  $\Gamma(C(X))$ . (pp. 92–105)

### On algebraically closed Krasner hyperfields

Alessandro Linzi

In this short paper, we prove two negative results: the first order theory of algebraically closed Krasner hyperfields is neither complete nor substructure complete, the latter meaning that the theory does not admit quantifier elimination.

(pp. 105–112)

### Distance measures between picture fuzzy multisets and their application to medical diagnosis

Yuming Feng, Taiwo O. Sangodapo

In this paper, the distance measures between picture fuzzy multisets are proposed as a generalisation of the existing distance measures between picture fuzzy sets. The validity of the transformation from distance measures between PFS to PFMS is carried out using numerical example. Also, an application to medical diagnosis of the proposed distance measures between picture fuzzy multisets is carried out using hypothetical medical database. (pp. 113–125)

### A note on hyperrings and hypermodules-Corrigendum

Engin Kaynar, Burcu Nişancı Türkmen, Ergül Türkmen

In this corrigendum to the paper, “A note on hyperrings and hypermodules” [5], we present revised Theorem 3.3 and Example 3.3 and correct some typographical errors.

(pp. 126–129)

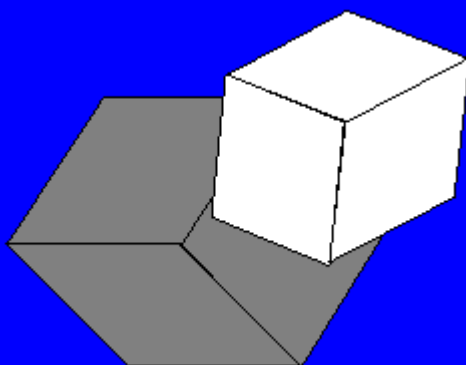
Finite groups whose sums of irreducible character degrees of all proper subgroups are large

Xingzheng Tang, Shitian Liu

Some scholars investigated the influence of the sum of all character degrees of a finite group on group structure. In this paper, we will study the influence of sums of all character degrees of all proper subgroups of a finite group on its structure. We will show that a finite group  $G$  is solvable when all proper subgroups  $H$  of  $G$  satisfy  $T(H) \geq \frac{2}{3}|H|$ , where  $T(H)$  is the sum of all character degrees of a finite group  $H$ .

(pp. 130–137)

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