

ABSTRACT

THE CONNECTION BETWEEN JORDAN DERIVATIONS AND NILPOTENT DERIVATIONS ON 2-TORSION-FREE SEMIPRIME RINGS

By

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This research investigates the relationship between Jordan derivations and nilpotent derivations on 2-torsion free semiprime rings. A 2-torsion free semiprime ring is a class of rings that exhibits strong structural stability under Jordan identities and is also relevant in the study of nilpotency properties of derivations. Based on the result of Bresar, every Jordan derivation on a 2-torsion free semiprime ring is shown to be an ordinary derivation. On the other hand, Chung and Luh proved that the nilpotency index of a nilpotent derivation on a 2-torsion free semiprime ring is always an odd integer. These results provide a foundation to examine the interplay of derivation properties on 2-torsion free semiprime rings, particularly in the context of Jordan derivations and nilpotent derivations. The method used in this research is a literature study with a deductive approach through mathematical proofs and the construction of examples to clarify the obtained results. This research is expected to strengthen the understanding of the structure of 2-torsion free semiprime rings in derivation theory and to serve as a basis for further studies in ring theory.

Keywords: semiprime ring, 2-torsion free, Jordan derivation, nilpotent derivation, nilpotency index.

ABSTRAK

HUBUNGAN DERIVASI JORDAN DAN DERIVASI NILPOTEN PADA RING SEMIPRIMA BEBAS 2-TORSI

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Penelitian ini mengkaji hubungan antara derivasi Jordan dan derivasi nilpoten pada ring semiprima bebas 2-torsi. Ring semiprima bebas 2-torsi merupakan kelas ring yang memiliki kestabilan struktural kuat terhadap identitas Jordan dan sekaligus relevan dalam pembahasan sifat nilpotensi derivasi. Berdasarkan hasil Bresar, setiap derivasi Jordan pada ring semiprima bebas 2-torsi terbukti merupakan derivasi biasa. Di sisi lain, hasil Chung dan Luh menunjukkan bahwa indeks nilpotensi derivasi pada ring semiprima bebas 2-torsi selalu berupa bilangan ganjil. Kedua hasil tersebut memberikan landasan untuk meninjau keterkaitan sifat-sifat derivasi pada ring semiprima bebas 2-torsi, khususnya dalam konteks perilaku derivasi Jordan dan derivasi nilpoten. Metode yang digunakan adalah studi literatur dengan pendekatan deduktif melalui pembuktian matematis dan penyusunan contoh untuk memperjelas hasil-hasil yang diperoleh. Penelitian ini diharapkan memperkuat pemahaman mengenai struktur ring semiprima bebas 2-torsi dalam kajian derivasi serta menjadi dasar bagi pengembangan penelitian lanjutan pada teori ring.

Kata-kata kunci: ring semiprima, bebas 2-torsi, derivasi Jordan, derivasi nilpoten, indeks nilpotensi.