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Free algebras in division rings with an involution

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Abstract

Some general criteria to produce explicit free algebras inside the division ring of fractions of skew polynomial rings are presented. These criteria are applied to some special cases of division rings with natural involutions, yielding, for instance, free subalgebras generated by symmetric elements both in the division ring of fractions of the group algebra of a torsion free nilpotent group and in the division ring of fractions of the first Weyl algebra.

Keywords: Free associative algebras, field of fractions of group algebras, involutions, symmetric elements

2010 MSC: Primary 16K40, 16S36, 16W10, Secondary 16S10, 16S34

1. Introduction

It has been conjectured by Makar-Limanov in [1] that a division ring which is infinite dimensional over its center k and finitely generated (as a division algebra over k) must contain a noncommutative free k -subalgebra. Makar-Limanov himself provided evidence for this in [2], where it is proved that the division ring of fractions of the first Weyl algebra over the rational numbers contains a free subalgebra of rank 2, and in [3], where the case of the division ring of

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