

Noncommutative Gröbner bases for commutative rings

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Every ideal of $K[X]$ lifts to an ideal of $K \langle X \rangle$ via the canonical map. It is sometimes an effective technique to work in the free algebra, even though the objects of interest are all commutative. Gröbner bases comprise a fundamental tool for algebraic computations, and are always finite in the commutative case. Given a Gröbner basis of an ideal of $K[X]$, we present some naturally related bases of its lift to $K \langle X \rangle$. Then we consider some problems concerning the finiteness of those bases. Complete answers are presented, ranging from nice characterizations to proofs of computational infeasibility.