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**Gwen Spencer\*** (gwenspencer@gmail.com) and **David Rolnick**. *On the Robust Hardness of Grobner Basis Computation.*

Grobner Basis computation is a classical problem in Computational Algebra. It is well known that computing a Grobner Basis for a general polynomial system is not possible in polynomial time (unless  $P=NP$ ). What about computing an *Approximate Grobner Basis*? In joint work, we proposed two models of what it means to compute an *Approximate Grobner Basis*. Both models allow an algorithm to selectively ignore some of the polynomials: the algorithm is only responsible for returning a Grobner Basis corresponding to the remaining polynomials. We prove that this approximate problem is still NP-Hard for lexicographic orders, even when the algorithm can ignore a substantial constant fraction of the polynomial system (both notions of “approximate” are parameterized). Our hardness results hold even when the algorithm is only required to work for polynomial systems whose maximum degree is guaranteed to be very low and each polynomial contains at most 3 variables. Our proofs are by reduction and depend on combining positive and negative algorithmic results from combinatorial optimization problems in graph coloring and logic.

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