

Quadratic and other forms in Free Probability

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Abstract

We report on recent progress in our study of polynomials of low degree in free random variables. In the first part, continuing [1], we show that the following conditions are equivalent for a quadratic form in free random variables :

1. it exhibits the phenomenon of cancellation of free cumulants
2. it preserves infinite divisibility
3. it can be written as a sum of commutators.

In addition, we present some central limit theorems whose limit laws exhibit interesting connections to classical analysis.

In the second part we announce a method to compute the distribution of certain polynomials of degree three which are relevant for the free version of the Cantelli problem.

This is joint work with W. Ejsmont (part 1), A. Piliszek, K. Szpojankowski and V. Vasilchuk (part 2).

[1] Wiktor Ejsmont and Franz Lehner, *Sample variance in free probability*, J. Funct. Anal. **273** (2017), no. 7, 2488–2520.