

# The free field meets free probability theory

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Noncommutative rational functions constitute a very natural class of noncommutative functions. Loosely speaking, they are built out of noncommutative polynomials by successive applications of the arithmetic operations addition, multiplication, and inversion. Algebraically, this intuition can be made precise by the so-called “free field”, whose elements are noncommutative rational functions in formal noncommuting variables. On the analytic side, one works instead with more concrete variables, such as operators living in finite von Neumann algebras, which puts noncommutative rational function into the framework of affiliated unbounded operators.

In my talk, which is based on joint work with Roland Speicher and Sheng Yin, I will explain why both approaches are in fact equivalent for a large class of operators, including those that have maximal free entropy dimension. I will further discuss some consequences of this result, in particular regarding regularity questions for noncommutative distributions.