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How should we quantise cycles in symmetric groups?

Hurwitz numbers are counts of covers of Riemann surfaces with given ramification. For maps from the sphere to itself, we may require most ramifications are $(r+1)$-cycles. Generating functions of these numbers naturally live on the spectral curve

$$y - e^{x^r y^r} = 0.$$

We want to quantise this curve to obtain an operator $P(\hat{x}, \hat{y}; \hbar)$ which annihilates the partition function of all-genus covers of the sphere. I will explain that there are at least two natural ways of doing this, with different corrections to the cycles, and different interpretations of the original spectral curve.

This is based on joint works with Gaëtan Borot, Vincent Bouchard, Petr Dunin-Barkowski, Danilo Lewański, Alexandr Popolitov, Sergey Shadrin, and Quinten Weller.