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On the Factorization of Lucas Polynomials via Lucas Atoms

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In 2020, Sagan and Tirrell introduced Lucas atoms, which are irreducible factors of Lucas polynomials. Their main goal was to investigate when certain combinatorial rational functions are actually polynomials. In a joint work with Miska, Murru, and Romeo, we present Lucas atoms in a more natural way than the original definition, providing straightforward proofs of their main properties. Moreover, we fully characterize the p-adic valuations of Lucas atoms for any prime p, thereby answering a question left open by Sagan and Tirrell. Finally, we show that the sequence of Lucas atoms is not holonomic, in contrast to the Lucas sequence, which satisfies a linear recurrence of order two.

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