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Bi-infinite Riordan matrices: A matricial approach to multiplication and composition of formal Laurent series

L.F. Prieto Martínez; J. Rico Cabrera

Abstract-

We propose and investigate a bi-infinite matrix approach to the multiplication and composition of formal Laurent series. We generalize the concept of Riordan matrix to this bi-infinite context, obtaining matrices that are not necessarily lower triangular and are determined, not by a pair of formal power series, but by a pair of formal Laurent series. We extend the First Fundamental Theorem of Riordan Matrices to this setting, as well as the Toeplitz and Lagrange subgroups, that are subgroups of the classical Riordan group. Finally, as an illustrative example, we apply our approach to derive a classical combinatorial identity that cannot be proved using the techniques related to the classical Riordan group, showing that our generalization is not fruitless.

Index Terms- Formal Laurent series; Bi-infinite matrices; Riordan group

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