Roots of Formal Power Series and New Theorems on Riordan Groups, Marshall M. Cohen, Morgan State University

Elements of the Riordan group $\mathcal{R}$ over a field $\mathbb{F}$ of characteristic zero are infinite lower triangular matrices which are defined in terms of pairs of formal power series. We introduce as a tool in the theory of Riordan groups the use of the roots $g(x)^{\frac{1}{n}}$ of elements $g(x)$ in the ring of formal power series over $\mathbb{F}$. We survey new theorems we have proved using roots. In particular we generalize C. Marshall [Congress. Num., 229 (2017), 343-351] and prove: Given arbitrary $g(x)$ with non-zero constant term, there exists a unique (explicit!) $F(x) = -x + f_2x^2 + \cdots$ such that $(g(x), F(x))$ is an involution. in $\mathcal{R}$.

Keywords: formal power series, Riordan group, roots of series, involution