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A New Generalization of Truncated-Type Polynomials and Their Properties

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Abstract

Truncated versions of classical special polynomials have been receiving growing attention in recent years, largely due to their connections with generating functions, combinatorial identities, and hypergeometric-type structures. Motivated by this interest, the present work introduces a new generalization of truncated-type polynomials built on a modification of the classical Frobenius–Euler generating function. The construction relies on a finite truncation applied to the exponential part of the generating function, which naturally gives rise to a flexible framework that includes several well-known polynomial families as special cases. Within this setting, we study a number of fundamental properties of the introduced polynomials: generating functions, recurrence relations, differential identities, and representation formulas involving Stirling numbers of the second kind. We also touch on connections with hypergeometric functions and take a closer look at how the zeros of these polynomials behave in the complex plane.

Keywords: Frobenius-Euler polynomials, truncated polynomials, generating functions, Stirling numbers, zeros of polynomials.

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