Kilar, Neslihan; Simsek, Yılmaz

Summary: The aim of this paper is to construct generating functions for a new family of polynomials, which are called parametric Hermite-based Milne-Thomson type polynomials. Many properties of these polynomials with their generating functions are investigated. These generating functions give us a generalization of some well-known generating functions for special polynomials such as Hermite type polynomials, Milne-Thomson type polynomials, and Apostol type polynomials. Using the Euler formula, functional equation method for generating function, and differential operator technique, we give relations among parametric Hermite-based Milne-Thomson type polynomials, the Bernoulli numbers, the Euler numbers, the Chebyshev polynomials, the Bernstein basis functions, homogeneous harmonic polynomials, and parametric kinds of Apostol type polynomials. Moreover, some computational formulas for these polynomials are derived. Finally, using Wolfram Mathematica version 12.0, some of these polynomials and their generating functions are illustrated by their plots under the special conditions. Potential relationships and connections of this paper’s results with the results of previous and future research are pointed out.

MSC:
05A15 Exact enumeration problems, generating functions
11B68 Bernoulli and Euler numbers and polynomials
11B73 Bell and Stirling numbers
26C05 Real polynomials: analytic properties, etc.
22B10 Structure of group algebras of LCA groups

Keywords:
Chebyshev polynomials; generating function; Hermite-type polynomials; homogeneous harmonic polynomials; Milne-Thomson-type polynomials; special functions

Software:
Mathematica

Full Text: DOI