

ON SOME COMBINATORIAL IDENTITIES INVOLVING THE TERMS OF GENERALIZED FIBONACCI AND LUCAS SEQUENCES

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Abstract

In this paper, we consider the Horadam sequence and some summation formulas involving the terms of the Horadam sequence. We derive combinatorial identities by using the trace, the determinant, and the n th power of a special matrix.

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1. Preliminaries

Generalized Fibonacci sequence $W_n = W_n(a, b; p, q)$ is defined as follows;

$$(1.1) \quad W_n = pW_{n-1} - qW_{n-2}, \quad W_0 = a, \quad W_1 = b.$$

Where $a, b, p,$ and q are arbitrary complex numbers, with $q \neq 0$. Since, these numbers have been studied firstly by Horadam(see, e.g., [1]) they are called as Horadam numbers. Some special cases of this sequence such as

$$(1.2) \quad U_n = W_n(0, 1; p, q), \quad V_n = W_n(2, p; p, q)$$

were investigated by Lucas[6]. Further and in detailed knowledge can be found in[1, 2, 3, 4, 5, 6]. If α, β assumed distinct, are the roots of

$$(1.3) \quad \lambda^2 - p\lambda + q = 0$$

then the sequence W_n has the Binet representation

$$(1.4) \quad W_n = \frac{A\alpha^n - B\beta^n}{\alpha - \beta},$$

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