R. S. Melham
Closed Forms for Finite Sums in Which the Denominator of the Summand is a Product of Trigonometric Functions,
Fibonacci Quart. 54 (2016), no. 3, 196–203.

Abstract

In this paper, we present closed forms for certain finite sums. In each case, the denominator of the summand is a product of sine or cosine functions. Furthermore, in each case, the arguments of the trigonometric functions in the denominator of the summand increase in arithmetic progression.