Closed Form Evaluations of Some Series Comprising Sums of Exponentiated Multiples of Two-Term and Three-Term Catalan Number Linear Combinations,

Abstract

Closed form evaluations of some infinite series comprising sums of exponentiated multiples of two-term and three-term Catalan number linear combinations are presented using three contrasting approaches. Known power series expansions of the trigonometric functions \(\sin(4\alpha)\) and \(\sin(6\alpha)\) each readily give a set of (four) results which are reformulated via a hypergeometric route and, additionally, using only the generating function for the Catalan sequence; the latter two methods are shown to be connected.