A Proof of a Conjecture of Knuth

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Abstract

From numerical experiments, D. E. Knuth conjectured that $0 < D_{n+4} < D_n$ for a combinatorial sequence (D_n) defined as the difference $D_n = R_n - L_n$ of two definite hypergeometric sums. The conjecture implies an identity of type $L_n = \lfloor R_n \rfloor$, involving the floor function. We prove Knuth's conjecture by applying Zeilberger's algorithm as well as classical hypergeometric machinery.