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ON THE COEFFICIENTS OF AN ASYMPTOTIC EXPANSION RELATED TO SOMOS' QUADRATIC RECURRENCE CONSTANT

Gergő Nemes

In this paper we study the coefficients of an asymptotic expansion related to Somos' Quadratic Recurrence Constant. We develop recurrence relations and an asymptotic estimation for them. We also show that these coefficients are related to the Catalan Bell Numbers.

1. INTRODUCTION

Somos' Quadratic Recurrence Constant, named after M. Somos [2, p. 496] [5], is the number

$$\sigma = \sqrt{1 + \sqrt{2 + \sqrt{3 + \sqrt{4 + \dots}}}} = 1.661687946 \dots$$

The constant σ arose when he had examined the asymptotic behavior of the sequence

$$(1) \quad q_n = 1, \quad q_n = a_n q_{n-1}^2, \quad n \geq 1,$$

with first four terms 1, 1, 2, 12, 576, 1678980, Somos showed that q_n has an asymptotic series as follows:

$$(2) \quad \frac{\sigma^n}{q_n} = a_0 + \frac{a_1}{n} + \frac{a_2}{n^2} + \frac{a_3}{n^3} + \frac{a_4}{n^4} + \dots, \quad n \rightarrow +\infty.$$

Mathematics Subject Classification: 65A01, 65A15, 11B87

Keywords and Phrases: Asymptotic approximation, generating function, recurrence relation

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