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On Hypergeometric Series and Continued Fractions

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Abstract: In this paper, we have established continued fractions representations for the ratio of Hypergeometric Series, Ordinary and Basic both.

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Introduction

Since the times of Euler and Gauss continued fractions have been playing a very important role in Number Theory and Classical Analysis. Significant contributions to the theory of continued fraction expansions were made by Ramanujan. In Chapter 12 of his second note book [17] and also in his "lost" notebook [18], Ramanujan recorded a number of continued fraction identities. This part of Ramanujan's work has been treated and developed consequently by several authors including Andrews [3], Hirschhorn [14], Carlitz [9], Gorden [13], Al-Salam and Ismail [2], Ramanathan [15][16], Denis [10][11][12], Bhargava and Adiga[5][6], Bhargava, Adiga and Somashekara [7][8], Adiga and Somashekara [1], Verma, Denis and Srinivasa Rao [20], Singh [19] and Bhagirathi [4].

1. Notations and Definitions

For α, real or complex, we define

$$[\alpha]_n = \alpha(\alpha+1)(\alpha+2)...(\alpha+n+1) \quad n > 0$$

$$[\alpha]_0 = 1$$

and

$$[\alpha_1\alpha_2\alpha_3...\alpha_r]_n = [\alpha_1]_n[\alpha_2]_n[\alpha_3]_n...[\alpha_r]_n$$

The ordinary hypergeometric series is defined as,

$$ {}_rF_s\left[\begin{array}{l} a_1, a_2, ..., a_r; z \\ b_1, b_2, ..., b_s \end{array}\right] = \sum_{n=0}^{\infty} \frac{[a_1, a_2, ..., a_r]_n z^n}{[b_1, b_2, ..., b_s]_n n!}, \quad (1.1)$$