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Certain bilateral basic hypergeometric transformations and mock theta functions

Bhaskar SRIVASTAVA

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ABSTRACT. In this paper we show that the bilateral mock theta functions corresponding to the mock theta functions of order five of the first kind can be related to the ones of the second kind. We give also some identities for the bilateral mock theta functions.

1. Introduction

Bilateral forms of mock theta functions have been defined by Watson [4, 5], Agarwal [1], A. Gupta [2] from time to time. They have studied their relationship with mock theta functions using bilateral basic hypergeometric transformations. It is interesting to note that in a number of cases the bilateral mock theta functions yield two different forms taking into account the positive and the negative series. This reveals some relations among ten bilateral mock theta functions. In §5, we present still other forms of the bilateral mock theta functions.

Ramanujan stated without proof that the several identities holding between mock theta functions belonging to the first kind $f_0(q)$, $\Phi_0(q)$, $\Psi_0(q)$, $F_0(q)$, $\chi_0(q)$ and the five mock theta functions of the second kind $f_1(q)$, $\Phi_1(q)$, $\Psi_1(q)$, $F_1(q)$, $\chi_1(q)$ are interrelated amongst themselves. In §6, we show that the bilateral mock theta functions corresponding to the mock theta functions of order five of the first kind can be related to the ones corresponding to the second kind.

In §7, we give identities for the bilateral mock theta functions that are analogous to the identities given by Ramanujan [Watson 2, p. 277].

Notations and symbols

We use the following usual basic hypergeometric notation: For $|q| < 1$, $(a)_n = (a;q)_n = (1-a)(1-aq)\dots\dots\dots(1-aq^{n-1})$ for $1 \le n \le \infty$, $(a)_0 =$

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