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COMBINATORICS OF THIRD ORDER MOCK THETA FUNCTION $f(q)$ AND SIXTH ORDER MOCK THETA FUNCTIONS $\phi(q)$, $\psi(q)$

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Dedicated to Prof. A.K. Agarwal on his 70^{th} ***Birth Anniversary***

Abstract: The third order mock theta function $f(q)$ is the generating function for the number of partitions with even rank minus the number of partitions with odd rank. In this paper, mock theta function $f(q)$ is interpreted in terms of n–color partitions which lead to a combinatorial proof of the above fact. The two sixth order mock theta functions $\phi(q)$ and $\psi(q)$ from Ramanujan's Lost Notebook are also interpreted in terms of n–color partitions by attaching weights.

Keyword and Phrases: Mock theta functions, (n + t)-color partitions, Generating functions.

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1. Introduction

The coefficients in the series representation of a mock theta function many times have a simple partition-theoretic interpretation. Fine's interpretation of the coefficients of series represented by the following third order mock theta function as the number of partitions into odd parts without gaps serves as an example to the above claim [3]:

$$\psi(q) = \sum_{n=1}^{\infty} \frac{q^{n^2}}{(q;q^2)_n}. \tag{1.1}$$

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