

A Note on Some Ramanujan's Modular Equations

(Received June 25, 2013)

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Abstract: In this paper, we establish certain modular equations influenced by Srinivasa Ramanujan using Maple.

Keywords: Dedekind's eta function, Modular Equations.

Mathematics Subject Classification: Primary 33C05, 11F20, 11Y99.

1. Introduction

In the unorganized pages of his second notebook [11], Ramanujan recorded 23 identities involving ratio of Dedekind's eta function of which have been proved by B. C. Berndt and L. -C. Zhang [5] by employing Ramanujan's modular equations of various degree, or via his mixed modular equations or via the theory of modular forms. For the wonderful introduction to modular equations see [2], [3], [4],[10], [11], [12] and for some beautiful subsequent work on modular equations see [1], [5], [6], [7], [9], [8].

In Section 2 of this paper, we set up some preliminary results which are useful and in the final section we establish certain modular equations. We conclude this section by recalling theta functions defined by Ramanujan.

In Chapter 16 of his second notebook [11], Ramanujan develops the theory of theta function and his theta function is defined by

$$\begin{aligned} f(a, b) &:= \sum_{n=-\infty}^{\infty} a^{\frac{n(n+1)}{2}} b^{\frac{n(n-1)}{2}} \\ &= (-a, ab)_{\infty} (-b, ab)_{\infty} (ab, ab)_{\infty}, \quad |ab| < 1 \end{aligned}$$

where

$$(a; q)_0 := 1$$