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Certain results involving Eta-function

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Abstract: In this paper, making use of a result due to Denis, Singh and Singh [2], we have established certain results involving Eta-functions.
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1. Introduction, Notations and Definitions:

In this paper we shall establish certain results involving eta-functions. This paper consists of three parts which include results involving eta-functions.
Eta function is defined as,

$$\eta(z) = e^{\pi iz/12}\prod_{n=1}^{\infty}(1-e^{2\pi inz}) = q^{\frac{1}{24}}[q;q]_{\infty}, \tag{1.1}$$

where $q = e^{2\pi iz}$.

Part - I

We shall be in need of the following known results,

$$\begin{aligned}{}_2\Psi_2\left[\begin{array}{c} aq_1^m, yq_1^m; q_1; xq_1 \\ q_1^{1+m}, ayq_1^{1+m}\end{array}\right]\ {}_2\Phi_1\left[\begin{array}{c}\alpha q, \beta q; q; x \\ \alpha\beta q\end{array}\right]\\ = \frac{[\alpha,\beta;q]_m[q_1, ayq_1; q_1]_m}{[q,\alpha\beta q;q]_m[a,y;q_1]_m}\left(\frac{q}{q_1}\right)^m\\ \times{}_2\Psi_2\left[\begin{array}{c}\alpha q^m, \beta q^m; q; xq \\ q^{1+m}, \alpha\beta q^{1+m}\end{array}\right]\ {}_2\Phi_1\left[\begin{array}{c} aq_1, yq_1; q_1; x \\ ayq_1\end{array}\right],\end{aligned} \tag{1.2}$$

[Denis, Singh and Singh 2; (4.4)]

where $\max(|q|,|q_1|) < |x| < 1$.