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On certain results involving the product of partial theta functions

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Abstract: In this paper, we have established a new identity for the product of two partial theta functions. Certain interesting results have been deduced as the special cases of the main identity.
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1. Introduction

We will use the standard q- notations,

$$[a;q]_\infty = \prod_{n=1}^{\infty}(1-aq^{n-1}),$$

$$[a_1,a_2,...,a_r;q]_\infty = [a_1;q]_\infty[a_2;q]_\infty...[a_r;q]_\infty,$$

$$[a;q]_0 = 1,$$

and

$$[a;q]_n = (1-a)(1-aq)(1-aq^2)...(1-aq^{n-1}) \quad \text{for} \quad n \geq 1.$$

Warnaar [6] proved the following generalization of Jacobi's triple product identity,

$$1+\sum_{n=1}^{\infty}(-)^n q^{n(n-1)/2}(a^n+b^n) = [q,a,b;q]_\infty \sum_{n=0}^{\infty} \frac{\left[\frac{aq}{q};q\right]_{2n} q^n}{[q,a,b,ab;q]_n}. \tag{1.1}$$

The celebrated Jacobi triple product identity [3; Eq. (1.6.1) page 15] is

$$\sum_{n=-\infty}^{\infty}(-)^n a^n q^{n(n-1)/2} = [q,a,q/a;q]_\infty. \tag{1.2}$$