Generalized Watson's summation formula for a ${}_3F_2(1)$

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Abstract

Summation formula is given for

$$ {}_3F_2\left(\begin{matrix} a,\, b,\, c \\ (a+b+i+1)/2,\, 2c+j \end{matrix} \middle| 1 \right) $$

with fixed j and arbitrary i ($i, j \in \mathbb{Z}$). This result generalizes the classical Watson's theorem which deals with the case $i = j = 0$.

Extensions to the cases of

$$ {}_3F_2\left(\begin{matrix} a,\, 1+i+j-a,\, c \\ e,\, 1+i+2c-e \end{matrix} \middle| 1 \right) $$

and

$$ {}_3F_2\left(\begin{matrix} a,\, b,\, c \\ 1+i+a-b,\, 1+i+j+a-c \end{matrix} \middle| 1 \right) $$

are given. Notice that the case $i = j = 0$ corresponds to the classical theorems due to Whipple and Dixon, respectively.