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Research Article

Some bilinear generating functions for Jacobi polynomials

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In a previous paper (3) the writer has proved

$$\sum_{n=0}^{\infty} \binom{m+n}{m} P_{m+n}^{(\alpha-n,\,\beta-n)}(x)\, t^n = [1+\tfrac{1}{2}(x+1)\,t]^{\alpha}\,[1+\tfrac{1}{2}(x-1)\,t]^{\beta}\, P_m^{(\alpha,\beta)}[x+\tfrac{1}{2}(x^2-1)\,t], \qquad (1\cdot1)$$

$$\sum_{n=0}^{\infty} \frac{(\lambda)_n}{(\mu)_n}(y-x)^n P_n^{(\alpha-n,\,\beta-n)}\left(\frac{x+y}{x-y}\right) = F_1(\lambda;\ -\alpha,\ -\beta;\ \mu;\ x, y), \qquad (1\cdot2)$$

where $P_n^{(\alpha,\beta)}(x)$ is a Jacobi polynomial defined as ((4) p.255)

$$P_n^{(\alpha,\beta)}(x) = \frac{(1+\alpha+\beta)_{2n}}{n!(1+\alpha+\beta)_n}\left(\frac{x+1}{2}\right)^n {}_2F_1\left[\begin{matrix}-n,\ -\beta-n;\\ -\alpha-\beta-2n;\end{matrix}\ \frac{2}{x+1}\right]. \qquad (1\cdot3)$$

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