Riesz-Jacobi transforms as principal value integrals

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We establish integral representations for Riesz transforms of all orders in the context of classical Jacobi expansions. We show that in case of odd orders these operators express as principal value integrals against kernels having non-integrable singularities on the diagonal. On the other hand, in case of even orders Riesz-Jacobi transforms are not singular operators, in the sense that they are given as usual integrals plus or minus, depending on the order, the identity operator. This extends and refines the results obtained in [1] in the ultraspherical situation, which is a very special case of the Jacobi setting.

We present an approach that is simpler and more classic than the one elaborated in [1]. However, our arguments require some auxiliary technical results such as quite precise estimates of derivatives of the Poisson-Jacobi kernel. The latter are obtained by means of the techniques developed recently in [3, 4].

References

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