

Multiplicative operator families on hypergroups, special functions and abstract Cauchy problems

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Session: 18. Harmonic analysis, orthogonal expansions and Dunkl theory

The abstract Cauchy problem of first order is intimately connected with semigroups of operators and the exponential functional equation. Analogously, the second order problem leads to cosine operators which satisfy the cosine functional equation, also known as d'Alembert's functional equation.

From our abstract point of view, a family of cosine operators is multiplicative with respect to the associated symmetric hypergroup. So we define multiplicative operator families on hypergroups in general and present some continuity results. Then we restrict to hypergroups arising from product formulas of special functions. Interesting examples are provided by Sturm-Liouville hypergroups on the nonnegative real line. Some corresponding abstract Cauchy problems are discussed.