"Umbral Images: Math in the Mirror.
Fractional Calculus and Applications"

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Abstract

The Umbral methods, as well as other techniques arising from the operator theory and the integral transforms theory, are a powerful tool to treat problems concerning the theory of special functions, the combinatorics calculus, the analysis of PDE solutions, in fractional dynamics too, and the relevant applications in physical or engineering problems. The flexibility of the methods allows indeed to manage not trivial problems as the integration of special functions or the study of fractional Cauchy problems. The creation of "umbral images" makes it possible to deal with rational or higher order transcendental functions by the use of the same operational forms, so realizing a "downgrading" of the complexity of the treated function. The umbral theory will be introduced in the present context and several different examples will be provided, from pure to applied Mathematics, included fields as Electrical Circuits, Quantum Mechanics, Geometry and so on.