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Advances in Fractional Integral Inequalities

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The flexibility of fractional calculus has empowered researchers to develop a wide range of convex integral inequalities that are fundamental in approximation theory. Classical inequalities, such as Jensen's, Simpson's, Ostrowski's, Hermite–Hadamard's, and trapezoidal inequalities, are commonly used to establish error bounds in numerical integration. To derive these inequalities, researchers employ various approaches, including the use of fractional operators, functional maps, relational frameworks, and other advanced analytical techniques, underscoring the significant influence of fractional calculus in contemporary mathematical analysis. For example, self-adjoint operators, which are fundamental in both mathematics and physics, facilitate the extension of classical numerical inequalities to linear operators on Hilbert spaces. These operators, which generalize Hermitian matrices, are defined by their symmetry, guaranteeing real eigenvalues and orthogonal eigenvectors. The analysis of inequalities involving self-adjoint operators has profound applications in functional analysis, quantum mechanics, operator theory, and optimization. The main objective of this Reprint is to continue research on the development of fundamental aspects of fractional integral inequalities, as well as their potential applications.

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