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Unified Formulas for Integer and Fractional Order Symbolic Derivatives and Anti-Derivatives of the Power-Inverse Trigonometric Class

This is a contination of a series of papers introduces a complete solution to the problem of symbolic differentiation and integration of any order (integer, fractional, real, or symbolic) for most of elementary and special functions by introducing unified formulas in terms of the Fox H-function which can be simplified in many cases to less general functions such as the Meijer G-function and the Hypergeometric function. In this talk, we illustrate the idea on the *power-inverse trigonometric class*. In particular, the *power-inverse sine class*

$$\Big\{f(x) : f(x) = \sum_{j=0}^{\ell} p_j(x^{\alpha_j}) \arcsin(\beta_j x^{\gamma_j}), \alpha_i \in \mathbb{C}, \beta_i \in \mathbb{C}\backslash\{0\}, \gamma_i \in \mathbb{R}\backslash\{0\}\Big\}, \tag{1}$$

the *power-inverse cos class*

$$\Big\{f(x) : f(x) = \sum_{j=0}^{\ell} p_j(x^{\alpha_j}) \arccos(\beta_j x^{\gamma_j}), \alpha_i \in \mathbb{C}, \beta_i \in \mathbb{C}\backslash\{0\}, \gamma_i \in \mathbb{R}\backslash\{0\}\Big\}, \tag{2}$$

and the *power-inverse tangengial class*

$$\Big\{f(x) : f(x) = \sum_{j=0}^{\ell} p_j(x^{\alpha_j}) \arctan(\beta_j x^{\gamma_j}), \alpha_i \in \mathbb{C}, \beta_i \in \mathbb{C}\backslash\{0\}, \gamma_i \in \mathbb{R}\backslash\{0\}\Big\}, \tag{3}$$

The approach does not depend on the integration techniques. Arbitrary order of differentiation is found according to the Riemann–Liouville definition, whereas we adopt the generalized Cauchy n-fold integral definition for arbitrary order of integration. Many examples will be given using a Maple code developed by the author.