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An Analytic Computation of Three-Loop Five-Point Feynman Integrals

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We evaluate the **three-loop five-point** pentagon-box-box massless integral family in the dimensional regularization scheme, via canonical differential equation. We use tools from **computational algebraic geometry** to enable the necessary integral reductions. The boundary values of the differential equation are determined **analytically** in the Euclidean region. To express the final result, we introduce a **new representation of weight six functions** in terms of one-fold integrals over the product of weight-three functions with weight-two kernels that are derived from the differential equation. **Our work paves the way to the analytic computation of three-loop multi-leg Feynman integrals.**

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