

An Explicit Expression of Generating Function for One-Loop Tensor Reduction

Physics is an empirical discipline, so any theory, no matter how elegant, must be tested through experiments. The scattering amplitude, as a physical quantity, serves as a bridge between theory and experiment. With the current precision of accelerators and experiments, the leading-order calculation of tree-level amplitude is insufficient in terms of experimental precision. Therefore, loop-level calculations constitute the fundamental components required for computing all physical processes. Consequently, investigating methods for computing loop diagrams and understanding their analytical structures is essential. This work introduces an explicit expression for the generating function for the reduction of an n -gon to an $(n - k)$ -gon. A novel recursive relation of generating function is formulated based on Feynman Parametrization in projective space, involving a single ordinary differential equation. The explicit formulation of generating functions provides crucial insights into the complex analytic structure inherent in loop amplitudes.

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