

Rewrite rules for nested integrals

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Abstract

Parameter integrals naturally arise as integral transforms or related convolution integrals, for instance. We consider the special case where such integrals originate from expressions involving nested integrals. More precisely, we deal with integrals where the integrand is given by a nested integral multiplied by a parameter-dependent factor. The aim is to compute those parameter integrals, or at least rewrite them in simpler form, using rewrite rules. The main feature of these rules is that they reduce the original integral to one of a similar type which has lower nested depth. A general principle to construct rewrite rules for this purpose will be discussed. Examples for Mellin transforms and Mellin convolutions originating from applications in perturbative quantum chromodynamics will be shown. Based on these rules also general properties of Mellin transforms and Mellin convolutions involving nested integrals can be proven.

Keywords

Nested integrals, parameter integrals, Mellin transform, Mellin convolution, rewrite rules