

Missing Stefano

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The master formula for the logarithmic integrals in the "regular" part is:

$$g_{(v)}(\lambda) \equiv \int_0^\infty \frac{dq^2}{p^2} R\left(\frac{q^2}{M^2}\right) \left(\frac{q^2}{M^2}\right)^\lambda = \frac{1}{\lambda^2} \left[\frac{\Gamma^2(1+\lambda)}{\Gamma(1+2\lambda)} - 1 \right] = -\zeta_2 + 2\zeta_3 \lambda + \dots + \frac{1}{2}(\zeta_2^2 - 7\zeta_4)\lambda^2 + \dots$$

$$1 + \lambda \ln\left(\frac{q^2}{M^2}\right) + \frac{1}{2}\lambda^2 \ln^2\left(\frac{q^2}{M^2}\right) + \dots$$

Treatment of the "singular" part:

$$\int_0^{M^2} \frac{dq^2}{p^2} Q_\varepsilon(q^2) \ln \frac{M^2}{q^2} \stackrel{\text{reinsert original notation}}{=} \int_0^{M^2} \frac{dq^2}{p^2} \tilde{Q}(\alpha_s(p^2); \varepsilon) \ln \frac{M^2}{q^2} =$$

here, integration over q^2 leads to DOUBLE and SINGLE ~~poles~~ ε -poles for each power of $d_f(M^2)$

$$= \int_0^{M^2} \frac{dq^2}{p^2} \tilde{Q}(\alpha_s(p^2); \varepsilon = \chi(\alpha_s(p^2))) \ln \frac{M^2}{q^2} +$$

↑ cusp anomalous dimension $A_f(\alpha_s(p^2))$

→ this term leads to DOUBLE and single ε -poles: its structure is similar to analogous term in ε -POLES of VIRTUAL Amplitudes

$$+ \int_0^{M^2} \frac{dq^2}{p^2} \left[\tilde{Q}(\alpha_s(p^2); \varepsilon) - \tilde{Q}(\alpha_s(p^2); \varepsilon = \chi(\alpha_s(p^2))) \right] \ln \frac{M^2}{q^2}$$

add and subtract $\varepsilon = \chi(\alpha_s)$

~~define (just to show the notation)~~
 ~~$\tilde{Q}(\alpha_s(p^2); \varepsilon) = \tilde{Q}(\alpha_s(p^2); \varepsilon) - \tilde{Q}(\alpha_s(p^2); \varepsilon = \chi(\alpha_s(p^2)))$~~

this term should lead to SINGLE ε -poles and regular terms in ε

⇒ the single ε -poles should be recasted in a form that is similar to that of the ε -POLES of VIRTUAL Amplitudes



Stefano at GGI

thanks to Yuri Dokshitzer







A photograph of three men in conversation. The man in the center, wearing a blue and white plaid shirt and glasses, has a speech bubble above him. The man on the left is wearing a light pink shirt and glasses. The man on the right is wearing a white polo shirt with red and black stripes. The background is a simple indoor setting with a window.

**What about
SCET?**



