Divergent Box Integral 7: $I_4^{\{D=4-2\epsilon\}}(0,0,m^2,p_4^2;s_{12},s_{23};0,0,0,m^2)$

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The result for this box (see figure) integral obtained from Eq.(A4), Equation 1 of ref. [**?**]. Expression valid for $s_{12}, s_{23}, p_4^2 < 0$.

$$I_4^{\{D=4-2\epsilon\}}(0,0,m^2,p_4^2;s_{12},s_{23};0,0,0,m^2) = \left(\frac{\mu^2}{m^2}\right)^{\epsilon} \frac{1}{s_{12}(s_{23}-m^2)}$$

$$\times \left[\frac{3}{2}\frac{1}{\epsilon^2} - \frac{1}{\epsilon}\left\{2\ln\left(1-\frac{s_{23}}{m^2}\right) + \ln\left(\frac{-s_{12}}{m^2}\right) - \ln\left(1-\frac{p_4^2}{m^2}\right)\right\}\right.$$

$$\left. -2\,\mathrm{Li}_2\left(1-\frac{m^2-p_4^2}{m^2-s_{23}}\right) + 2\ln\left(\frac{-s_{12}}{m^2}\right)\ln\left(1-\frac{s_{23}}{m^2}\right) - \ln^2\left(1-\frac{p_4^2}{m^2}\right) - \frac{5\pi^2}{12}\right] + \mathcal{O}(\epsilon)$$

See the file on notation. Analytic continuation by the replacements $s_{ij} \to s_{ij} + i\varepsilon, p_j^2 \to p_j^2 + i\varepsilon$. An identical expression for this integral is given in Eq.(6.75) of [**?**].

A more complicated expression for this integral is given in ref. [**?**] where it is called D_0^a.

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References

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