One Loop Matching for Quasi PDF
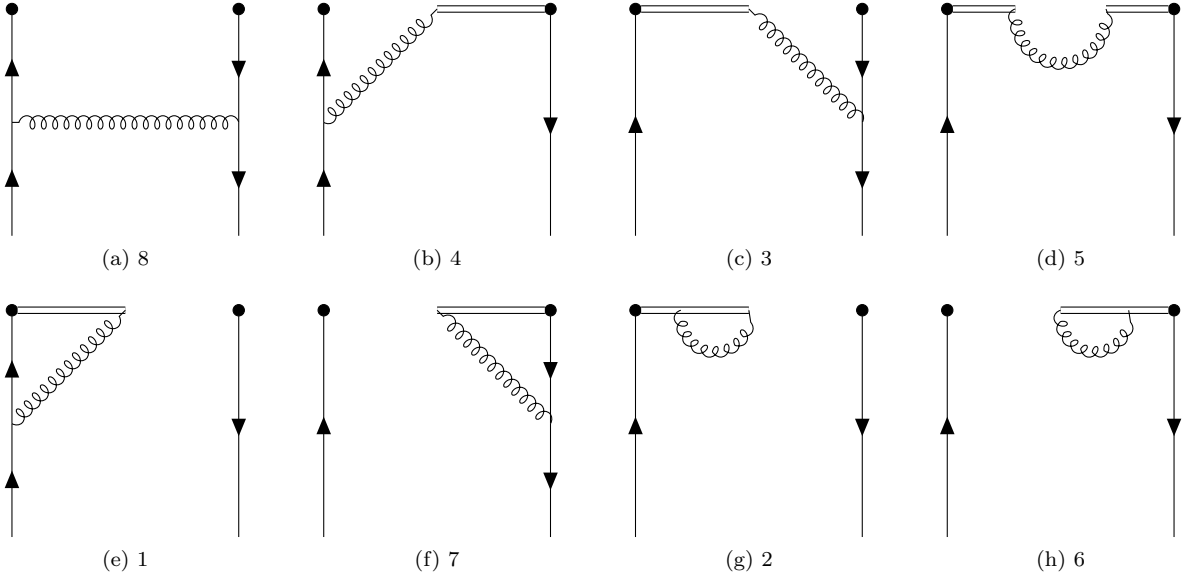
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1 Diagrams

Figure 1: Diagrams of quasi PDF in Feynman gauge.

2 Analytic Results

$$
\Gamma_a = \tilde{q}_{11} = \frac{\alpha_S C_F}{2\pi}
\begin{cases}
(x-1)\ln\frac{x-1}{x} + 1, & x > 1 \\
(1-x)\ln\frac{(P^z)^2}{m^2} + (1-x)\ln\frac{4x}{1-x} + 1 - \frac{2x}{1-x}, & 0 < x < 1 \\
(x-1)\ln\frac{x}{x-1} - 1, & x < 0
\end{cases}
\tag{1}
$$

$$
\Gamma_b = \tilde{q}_{12} = \frac{\alpha_S C_F}{2\pi}
\begin{cases}
-\frac{2x}{1-x}\ln\frac{x-1}{x} - \frac{1}{1-x}, & x > 1 \\
\frac{2x}{1-x}\ln\frac{(p^z)^2}{m^2} + \frac{2x}{1-x}\ln\frac{4x}{1-x} + 1 - \frac{x}{1-x}, & 0 < x < 1 \\
-\frac{2x}{1-x}\ln\frac{x}{x-1} + \frac{1}{1-x}, & x < 0
\end{cases}
\tag{2}
$$

$$
\Gamma_d = \tilde{q}_{13} = \frac{\alpha_S C_F}{2\pi}
\begin{cases}
\frac{1}{1-x}, & x > 1 \\
-\frac{1}{1-x}, & 0 < x < 1 \\
-\frac{1}{1-x}, & x < 0
\end{cases}
\tag{3}
$$

3 Numerical Results ($z = 1/4$)

Diagram a/8

`(0.477465 CV(1,3) CV(2,4/3))/s-0.106103 CV(1,3) CV(2,4/3) log(s)-0.563075 CV(1,3) CV(2,4/3)`

Diagram b/4

`0.212207 CV(1,3) CV(2,4/3) log(s)-0.273255 CV(1,3) CV(2,4/3)`

Diagram c/3

`(0.339531 CV(1,3) CV(2,4/3))/s-0.509296 CV(1,3) CV(2,4/3)`

Diagram d/5 no input ".m" file for FIRE.