function $D_{ab}^{\mu\nu}$, we have on the right-hand side the remnant of the gauge constraint,

$$\mathcal{E}_{\mu\nu} \;:=\; \int \frac{d^4p}{(2\pi)^4}\,\frac{e^{-i\,p\cdot(x-y)}}{p^2+i0^+}\;\left[g_{\mu\nu}\;+\;\sum_{s=1,2}\varepsilon_\mu^\lambda(p,s)\,\varepsilon_{\lambda\nu}^*(p,s)\right] \tag{29}$$

which involves a sum over the two physical (transverse) gluon polarizations (e.g. in Feynman gauge $\varepsilon_\mu^\lambda = g_\mu^\lambda$ and thus $\sum_s \varepsilon_\mu^\lambda \varepsilon_{\lambda\nu}^* = -g_{\mu\nu}$, i.e. $\mathcal{E}_{\mu\nu} = 0$). We note that equations (28) are of the form of Dyson-Schwinger equations [22], and can be rewritten in symbolic operator notations as

$$\begin{aligned} S \;&=\; S_0 \;+\; S_0\,\Sigma\,S \;, \qquad\qquad & D \;&=\; D_0 \;-\; D_0\,\Pi\,D \\ \Delta \;&=\; \Delta_0 \;+\; \Delta_0\,\Xi\,\Delta \;, \qquad\qquad & \tilde{\Delta} \;&=\; \tilde{\Delta}_0 \;+\; \tilde{\Delta}_0\,\tilde{\Xi}\,\tilde{\Delta} \;, \end{aligned} \tag{30}$$

where $S_0,\ D_0,\ \Delta_0,\ \tilde{\Delta}_0$ denote the free-field Green functions that satisfy the equations of motion in the absence of self and mutual interactions. Fig. 3 illustrates the diagrammatic representation of the Green functions $S, D, \Delta, \tilde{\Delta}$, the self-energies $\Sigma, \Pi, \Xi, \tilde{\Xi}$, and the Dyson-Schwinger equations (30).

A quantum transport formalism can be derived from the equations (28) that is very suitable for the present purposes [19]. We confine ourselves here to sketching the essential steps. One introduces the *Wigner transforms* $\mathcal{W}$ [23] of the Green functions and the self energies $W \equiv S, D, \Delta, \Sigma, \Pi, \Xi$:

$$\mathcal{W}(r,p) \;=\; \int d^4R\,e^{ip\cdot R}\,W\,(r,R) \quad , \tag{31}$$

where

$$W(r,R) \;\equiv\; W\left(r+\frac{R}{2}, r-\frac{R}{2}\right) \;=\; W(x,y)\;, \tag{32}$$

with $r \equiv (x+y)/2$ and $R \equiv x-y$ denoting the center-of-mass and relative coordinates, respectively, and R being the canonical conjugate to the momentum p (as before r, p, etc., denote four vectors, and $a\cdot b \equiv a_\mu b^\mu$). The equations of motion for the Wigner transforms $\mathcal{W}(r,p)$ are now obtained [19] under the assumption that the Green functions and self-energies $W(r,R)$ can be approximated by a gradient expansion in r up to first order:

$$W(r+R,R) \;\simeq\; W(r,R) \;+\; R\cdot\frac{\partial}{\partial r}W(r,R)\;. \tag{33}$$

This assumption implies a restriction to quasi-homogenous or moderately inhomogenous systems, such that the Green functions vary only slowly with r. In homogenous systems,