

Here, we would like to prove eq. (25). After contracting the heavy-quark propagator, we start at the following point:

$$\begin{aligned}
& \Theta(-v \cdot x) \delta^{(3)}(x_\perp) \langle 0 | \bar{q}(0) \Gamma_1 P_+ \Gamma_2 q(x) | 0 \rangle \\
&= \Theta(-v \cdot x) \delta^{(3)}(x_\perp) \left[\langle 0 | \bar{q}(0) \Gamma_1 P_+ \Gamma_2 q(0) | 0 \rangle + x^\mu \langle 0 | \bar{q}(0) \Gamma_1 P_+ \Gamma_2 D_\mu q(0) | 0 \rangle + \right. \\
& \quad \left. \frac{1}{2} x^\mu x^\nu \langle 0 | \bar{q}(0) \Gamma_1 P_+ \Gamma_2 D_\mu D_\nu q(0) | 0 \rangle + \dots \right] \tag{1}
\end{aligned}$$

Now we start by investigating the first term in the sum:

$$\langle 0 | \bar{q}_\alpha^i(0) \Gamma_{1,\alpha\beta} P_{+,\beta\gamma} \Gamma_{2,\gamma\delta} q_\delta^j(0) | 0 \rangle = A \delta^{ij} \delta_{\alpha\delta} \tag{2}$$

$$\Leftrightarrow \delta^{ij} \delta_{\alpha\delta} \langle 0 | \bar{q}_\alpha^i(0) \Gamma_{1,\alpha\beta} P_{+,\beta\gamma} \Gamma_{2,\gamma\delta} q_\delta^j(0) | 0 \rangle = 4 \cdot A N_c \tag{3}$$

Notice that we implicitly sum over the flavors i, j , hence N_c also appears in the RHS and cancels the one on the LHS. So we can solve for A :

$$A = \frac{1}{4} \underbrace{\Gamma_{1,\alpha\beta} P_{+,\beta\gamma} \Gamma_{2,\gamma\delta} \delta_{\alpha\delta}}_{= \text{Tr}[\Gamma_1 P_+ \Gamma_2]} \langle 0 | \bar{q} q | 0 \rangle \tag{4}$$