Problem A-one

From good old QED:

$$e \left(\begin{bmatrix} [B| \\ \langle B| \end{bmatrix}^T \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} \begin{pmatrix} & \sigma_\mu \\ \bar{\sigma}_\mu & \end{pmatrix} \begin{pmatrix} |A\rangle \\ |A] \end{pmatrix} \right) \frac{\langle \xi \sigma_\mu q]}{\sqrt{2} \langle \xi q \rangle} (2\pi)^4 \delta^4 \left({}^{P_A^{+P_B^+}}_{A+B} \right)$$

(b)   (a)

$$\left(\frac{e}{\sqrt{2}} \frac{\delta^4}{\langle \xi q \rangle} \right) \left([Bq]\langle \xi A \rangle + \langle B\xi \rangle [q A] \right)$$

$$" \quad \frac{1}{\langle q \hat{P}_A \xi]} \left([B q]\langle q \hat{P}_A \xi]\langle \xi A \rangle \right.$$
$$\left. + \langle B\xi \rangle [\xi \bar{P}_A q\rangle [q A] \right)$$

(c) $|q\rangle[q| = \hat{q}$

$$= \left([B\bar{q} \hat{P}_A \xi A \rangle + \langle B \xi \hat{P}_A \hat{q} A] \right)$$

$$= \underbrace{\left(-[B \bar{P}_A \hat{q} \xi A \rangle \right.}_{(e)} - \underbrace{\langle B \xi \hat{q} \hat{P}_A A]}_{(e)}$$

$$= \left(-\langle A \xi \bar{q} \hat{P}_A B] \right. \qquad "$$

$$= \left(\langle A \xi \bar{q} (\hat{q} + P_B) B] \right.$$

$$" \quad \left(m \langle A \xi \bar{q} B \rangle - \langle B \xi \bar{q} A \rangle m \right)$$

$$\frac{e}{\sqrt{2}} \frac{1}{\langle q \hat{P}_A \xi] \langle \xi q \rangle} \left(m \langle A (\xi \bar{q} + \hat{q} \xi) B \rangle \right.$$

$$\frac{e}{\sqrt{2}} \quad \frac{m \; \langle \xi q \rangle [q \xi]}{\langle q \; \hat{p}_A \; \xi] \; \langle \xi q \rangle} \qquad \langle AB \rangle \qquad \left(\begin{array}{c} \text{Dirae} \\ \text{delta} \end{array} \right)$$

(C)

Solution