Dirac fermions

\[ \{ \gamma^\mu, \gamma^\nu \} = 2\eta^\mu\nu \]  

(0.1)

\[ \gamma^0 = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}, \quad \gamma^i = \begin{pmatrix} 0 & \sigma^i \\ -\sigma^i & 0 \end{pmatrix} \]  

(0.2)

\[ \Lambda_{\frac{1}{2}}(\vec{k}) = \begin{pmatrix} e^{\frac{1}{2} \beta k_\sigma} & 0 \\ 0 & e^{-\frac{1}{2} \beta k_\sigma} \end{pmatrix}, \quad \cosh \beta = \frac{k_0}{m}, \quad \sinh \beta = -\frac{|\vec{k}|}{m} \]  

(0.3)

\[ u^r_k = \Lambda_{\frac{1}{2}}(\vec{k}) u^r_0, \quad u^r_0 = \sqrt{m} \begin{pmatrix} \xi^r \\ \xi^r \end{pmatrix}, \]  

(0.4)

\[ v^r_k = \Lambda_{\frac{1}{2}}(\vec{k}) v^r_0, \quad v^r_0 = \sqrt{m} \begin{pmatrix} \xi^r \\ -\xi^r \end{pmatrix}, \]  

(0.5)

\[ \xi^{(1)} = \begin{pmatrix} 1 \\ 0 \end{pmatrix}, \quad \xi^{(2)} = \begin{pmatrix} 0 \\ 1 \end{pmatrix} \]  

(0.6)

\[ (\vec{k} - m) u^r_k = 0, \quad (\vec{k} + m) v^r_k = 0 \]  

(0.7)

\[ \bar{u}^r_k u^s_k = 2m \delta^{rs}, \quad \bar{v}^r_k v^s_k = -2m \delta^{rs}, \quad \bar{u}^r_k v^s_k = 0 = \bar{v}^r_k u^s_k \]  

(0.8)

\[ (u^r_k) \dagger u^s_k = 2\omega_{k} \delta^{rs}, \quad (v^r_k) \dagger v^s_k = 2\omega_{k} \delta^{rs}, \quad (u^r_k) \dagger v^s_{-k} = 0 = (v^r_k) \dagger u^s_{-k} \]  

(0.9)

\[ \sum_{r=1,2} u^r_k \bar{u}^r_{-k} = \vec{k} + m, \quad \sum_{r=1,2} v^r_k \bar{v}^r_{-k} = \vec{k} - m \]  

(0.10)