QFT

Chapter 35: Manipulating Spinor Indices

Overview

- We use the metric g to manipulate vector indices, as has been seen previously.
  - Why? It's invariant under Lorentz Transformations

$$\Lambda_\mu{}^\rho \Lambda_\nu{}^\sigma g_{\rho\sigma} = g_{\mu\nu}$$

- When manipulating spinor indices, we use the Levi-Cevita symbol, which is similarly invariant.

$$L_\mu{}^\rho(\Lambda) L_\nu{}^\sigma(\Lambda) \varepsilon_{\rho\sigma} = \varepsilon_{\mu\nu}$$

- Here, Srednicki works out a bunch of equations.
  - Rather than repeating the math, let's briefly review the meaning of this stuff….

Review

- The four-dimensional Pauli Vector also happens to be invariant:

$$\sigma^{\mu}_{a\dot{a}} = (I, \vec{\sigma}) \qquad \bar{\sigma}^{\mu\dot{a}a} = (I, -\vec{\sigma})$$

- Recall that S_L is the generator of the Lorentz group for a left-handed spinor
  - In the same way, M is the generator of the Lorentz group for a scalar
  - M and S are anti-symmetric; they therefore have six degrees of freedom. These correspond to boosts and rotations for each representation.
  - It is possible to express these generators in terms of the invariant symbols (just as we did in chapter 2 for the scalar generators), see equations 35.21-35.22