

Exercise 32: Low energy calculations

In exercise 30 you have calculated the leading contribution to elastic scattering of Goldstone bosons, which is of order $(E/M)^4$ (E stands for the energy of the scattered bosons). Calculate the leading corrections to that result, of order $(E/M)^6$, and the next-to-leading corrections, of order $(E/M)^8$. The latter will involve a divergent diagram with one loop. Regularize and renormalize. Experiment with different regularizations and renormalization prescriptions. What type of counterterm(s) do you need?

Exercise 33: Weyl spinors

Show that the transformations

$$\psi_\alpha \rightarrow M_\alpha^\beta \psi_\beta \quad (1)$$

$$\bar{\psi}^{\dot{\alpha}} \rightarrow [M^{\dagger-1}]^{\dot{\alpha}}_{\dot{\beta}} \bar{\psi}^{\dot{\beta}}, \quad (2)$$

where $M \in SL(2, C)$, do indeed correspond to the $(0, 1/2)$ and $(1/2, 0)$ representations of the Lorentz group. *Hint:* Consider infinitesimal transformations.

Exercise 34: σ matrices

Show that $\bar{\sigma}_0 = \sigma_0$ and $\bar{\sigma}_i = -\sigma_i$.