
Quantum Field Theory 1 – Tutorial 12

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tutorial date: week of 23.01.2023

Problem 1: Trace technology

In the evaluation of QED processes we often encounter traces over products of γ matrices. This can be done very efficiently by using the algebraic properties of the γ matrices. Use the anticommutation properties γ matrices and the cyclic property of the trace to show the following identities

$$\mathrm{tr}(\gamma^\mu \gamma^\nu) = 4\eta^{\mu\nu}, \quad (1)$$

$$\mathrm{tr}(\gamma^\mu \gamma^\nu \gamma^\rho \gamma^\sigma) = 4(\eta^{\mu\nu} \eta^{\rho\sigma} - \eta^{\mu\rho} \eta^{\nu\sigma} + \eta^{\mu\sigma} \eta^{\nu\rho}). \quad (2)$$