
Quantum Field Theory 1 – Tutorial 8

Lectures: Jan Pawłowski

pawłowski@thphys.uni-heidelberg.de

Tutorials: Michael Scherer

scherer@thphys.uni-heidelberg.de

Institut für Theoretische Physik, Uni Heidelberg

tutorial date: 7 December 2016

Problem 1: Slash notation

Using the slash notation $\not{\partial} = \partial_\mu \gamma^\mu$ introduced by Feynman, the Dirac equation reads

$$(i\not{\partial} - m)\psi = 0.$$

- a) For $\psi(x) = u(p)e^{-ipx}$ where $p^2 = m^2$, show that the Dirac equation in momentum space reads

$$(\not{p} - m)u(p) = 0. \tag{1}$$

- b) Using the Dirac algebra

$$\{\gamma^\mu, \gamma^\nu\} = 2\eta^{\mu\nu}\mathbf{1},$$

show that for arbitrary $\tilde{u}(p)$

$$u(p) = (\not{p} + m)\tilde{u}(p)$$

solves the Dirac equation (1) when $p^2 = m^2$.