Problems for Quantum Field Theory 1
8. Tutorial

Problem 1: *Slash notation*

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

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

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

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

Using the Dirac algebra

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

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

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

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