Introduction to quantum electrodynamics
135.045 - (VO 2,0) 2015S

Homework #03 (Mar 23, 2015)

3.1 Show that the Clifford algebra relation (2.12) $\{\gamma^\mu, \gamma^\nu\} = 2g^{\mu\nu}\mathbb{1}$ is left unchanged by $\gamma^\mu = S^{-1}(L)\gamma^\rho(L^{-1})^\mu{}_\rho S(L)$ and $\gamma^\nu = S^{-1}(L)\gamma^\sigma(L^{-1})^\nu{}_\sigma S(L)$. (Eq. (2.26)).

3.2 Show that $[\gamma^\mu, T] = \omega^\mu{}_\nu\gamma^\nu$ is solved by $T = -(i/2)\omega_{\mu\nu}S^{\mu\nu}$ with $S^{\mu\nu} := (i/4)[\gamma^\mu, \gamma^\nu]$. (Eq. (2.29))

3.3 Check that $S = \mathbf{1} - \frac{\varepsilon}{4}[\gamma^1, \gamma^2] = \mathbf{1} + \varepsilon\frac{i}{2}\Sigma_3$ with $\Sigma_3 = \sigma_3 \oplus \sigma_3$ in the Dirac and in the chiral representation. (Eq. (2.31))