# Flavor Physics – Exercise Sheet 9 – SomSem 2015

Discussion: 17/07 during the tutorial

### Exercise 1: Mass terms

Show that the mass term for a particle decribed by a spinor $\psi$ is given by,

$$m\bar{\psi}\psi = m\left(\bar{\psi}_L\psi_R + \bar{\psi}_R\psi_L\right),$$

i.e. that the terms $\bar{\psi}_L\psi_L$ and $\bar{\psi}_R\psi_R$ vanish. Hint: Express the chirality states by using the projection operators.

### Exercise 2: Chirality-flip

Show that $(\psi_{L,R})^C = (\psi^C)_{R,L}$.

### Exercise 3: Neutrinoless double beta decay

A signature for neutrinos being Majorana particles, i.e. $\nu^C = \nu$, is the neutrinoless double beta decay $(0\nu2\beta)$. Draw the Feynman diagram for the process $(A,Z) \to (A, Z+2) + 2e^-$ on quark-level.