

Supplementary stuff:

①  $[i\partial_t - \vec{\alpha} \cdot \vec{p} - \beta m] |\psi\rangle$

In  $\vec{\alpha}$ - $\beta$  Rep.  $\gamma_5 = \begin{pmatrix} 0 & \mathbb{1}_{2 \times 2} \\ \mathbb{1}_{2 \times 2} & 0 \end{pmatrix}$

$P_{\pm} = \frac{1 \pm \gamma_5}{2}$

Note that  $P_+ + P_- = \mathbb{1}$   
 $P_+ P_- = P_- P_+ = 0$

Ortho-Normal stuff

show that  $P_+ |\psi\rangle, P_- |\psi\rangle$  are equivalent to Right-handed, Left-handed Weyl fermions.

[i.e.  $P_{\pm} |\psi\rangle$  satisfy those equations for  $\chi_{R,L}$ ]

②  $\left\{ \begin{array}{l} \gamma_5 \text{ chge} \\ \gamma_5 \text{ Current} \end{array} \right. \begin{array}{l} \psi^\dagger \gamma_5 \psi \\ \psi^\dagger \vec{\alpha} \gamma_5 \psi \end{array} \leftarrow \gamma_5 \text{-Rotation generated}$

$\left\{ \begin{array}{l} \text{Normal chge} \\ \text{Normal current} \end{array} \right. \begin{array}{l} \psi^\dagger \psi \\ \psi^\dagger \vec{\alpha} \psi \end{array} \leftarrow U(1) \text{-Rotation generated}$