

Recitation #14 Solutions

$$1) \quad \vec{\sigma} \cdot \vec{p} \psi_A = (E+m) \psi_B \approx 2m \psi_B$$

N.R. limit

with  $\psi_A = \chi^s$   $\vec{\sigma} \cdot \vec{p} \chi^s = p (-1)^{s+1} \chi_s$

$$\Rightarrow \psi_B = \left(\frac{p}{2m}\right) (-1)^{s+1} \chi_s$$

$$= \frac{1}{2} \left(\frac{v}{c}\right) (-1)^{s+1} \chi_s$$

$$2) \quad \gamma^{k\dagger} = -\gamma^k, \quad \gamma^{0\dagger} = \gamma^0 \Rightarrow (\gamma^\mu)^\dagger = \gamma^0 \gamma^\mu \gamma^0$$

from  $(\gamma^\mu p_\mu - m) \psi = 0$

$$\left[ \psi^\dagger (\gamma^\mu p_\mu - m) = 0 \right] \gamma^0 \quad \text{multiply on right}$$

$$\psi^\dagger (\gamma^\mu + \gamma^0 \gamma^\mu \gamma^0 p_\mu - m \gamma^0) = 0$$

$$\gamma^0 \gamma^\mu (\gamma^0)^2$$

$$\Rightarrow \boxed{\psi^\dagger (\gamma^\mu p_\mu - m) = 0}$$