

QUANTUM FIELD THEORY
PHY 655/461

ASSIGNMENT VIII

- (1) What are the momentum space Feynman rules for QED ?
- (2) Consider Møller scattering in QED

$$e^- e^- \rightarrow e^- e^-$$

What are the Feynman diagrams for this process. Motivate the relative sign between the diagrams starting from the LSZ reduction formula. Compute the differential cross section for this process.

- (3) Prove the following identities

$$\begin{aligned}\text{Tr} [\text{odd \# of } \gamma \text{ matrices}] &= 0 \\ \text{Tr} [\gamma^\alpha \gamma^\beta] &= 4g^{\alpha\beta} \\ \text{Tr} [\gamma^\mu \gamma^\nu \gamma^\alpha \gamma^\beta] &= 4(g^{\mu\nu} g^{\alpha\beta} + g^{\mu\beta} g^{\nu\alpha} - g^{\mu\alpha} g^{\nu\beta})\end{aligned}$$

- (4) Compute the spin, polarization summed/averaged $|\overline{\mathcal{M}}|^2$ for Compton scattering, in QED.