

Advanced Quantum Mechanics  
Problem set III

Note: You may use any  $\delta$ -matrix trace theorems without proof.

1. Using the results from Möller ( $e^-e^- \rightarrow e^-e^-$ ) scattering calculate the differential cross-section for Bhabha scattering ( $e^+e^- \rightarrow e^+e^-$ ). Use the expression on page 8, batch XIV (#7) and complete the process of integrating over final state variables etc.

Use only momentum substitution discussed in class and outlined in batch XV, you don't have to redo the problems' spin traces etc.

2. Calculate the differential cross section for the process  $e^+e^- \rightarrow \mu^+\mu^-$ . We began treating this in class. Take the ultra-relativistic limit i.e. all  $E, p \gg m, M$  ( $m =$  electron mass,  $M =$  muon mass). Do all the spin sums etc yourself.

<Happy Christmas & New Year>

Farrukh

[P.S. Use any books you please]