

PHY 5667 : Quantum Field Theory A, Fall 2002

November 26th, 2002

Final Exam

(due Friday December 13th, 2002)

Consider the electron-photon vertex correction ($\delta F_1(q^2)$) and the electron self-energy correction (δZ_2) at one loop in QED. Using dimensional regularization, and keeping track only of the ultraviolet (UV) and infrared (IR) divergent terms, show that:

1. $\delta F_1(0) = -\delta Z_2$;
2. the IR divergences in $\delta F_1(q^2) - \delta F_1(0) = \delta F_1(q^2) + \delta Z_2$ exactly cancel the corresponding divergences of the one-photon emission process: $e^- \rightarrow e^- + \gamma$;
3. explain the meaning of the cancellations you have verified in points **(1.)** and **(2.)** above.