

## Relativistic Quantum Field Theory, Fall 2006

### Homework Assignment # 12

(Due Wednesday, November 29, after the lecture.)

#### Lectures and Reading Assignments:

Readings are from “*An Introduction to QFT*” by Peskin and Schroeder.

- Lec 25, 11/27 (Mon): Electron Wavefunction Renormalization. Dimensional Regularization. **Sec. 7.1, 7.5 (pp. 249-251)**
- Lec 26, 11/29 (Wed): Photon Propagator and Electric Charge Renormalization. **Sec. 7.5**

#### Problems:

Numbered problems are from Peskin and Schroeder, Ch. 7.

1. Using Pauli-Villars regularization, show that  $\delta F_1(0) + \delta Z_2 = 0$ , where  $\delta F_1(0)$  is the one-loop correction to the formfactor  $F_1$  in the electron vertex function evaluated at  $q^2 = 0$ , and  $\delta Z_2$  is the electron wavefunction renormalization at one loop.
2. Repeat this calculation regulating the divergent integrals by imposing a cutoff  $\Lambda$  on the Euclidean momentum. Do you get the same result?
3. Repeat this calculation using dimensional regularization.