PHY 5667 : Quantum Field Theory A, Fall 2007

October 4^{th}, 2007

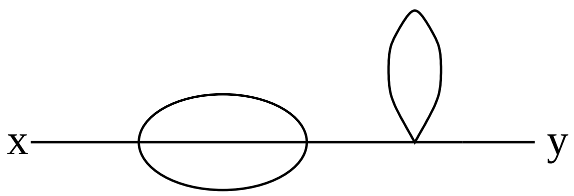
Assignment # 5

(due Thursday October 19^{th}, 2007)

1. Show that the QED Lagrangian in Eq. (4.4) of Peskin and Schroeder's book is invariant under the gauge transformation given in Eq. (4.6).

2. Using the same technique applied to prove Eq. (4.37) of Peskin and Schroeder's book, show explicitly how to obtain Eq.(4.39). Also, show that $\langle 0|T\{\phi(x_1)\phi(x_2)\phi(x_3)\}|0\rangle = 0$.

3. The following Feynman diagram:



represents a contribution to $\langle\Omega|T\{\phi(x)\phi(y)\}|\Omega\rangle$. Explain from which term of the perturbative expansion of $\langle\Omega|T\{\phi(x)\phi(y)\}|\Omega\rangle$ does it come from and write the corresponding analytical contribution both in position-space and in momentum-space.