

Problem set 6

Due Nov. 6, 2009

NOT GRADED 1. Obtain the propagator (G_2) for a free Schrödinger field. You should find

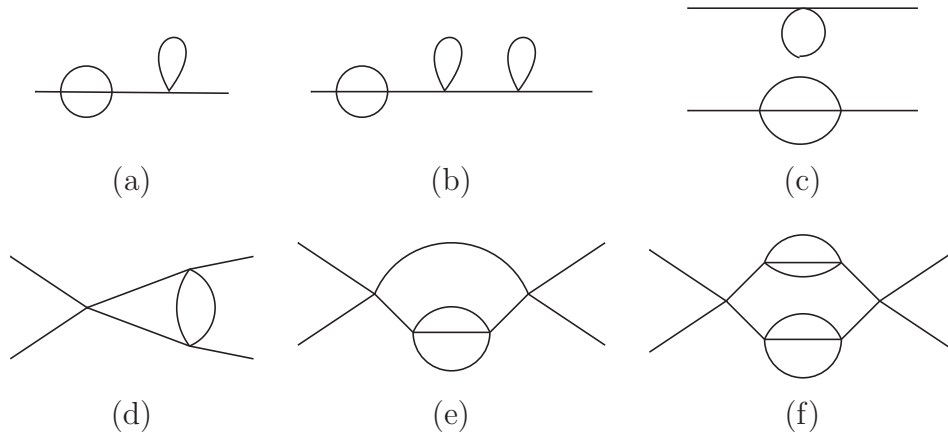
$$\frac{i}{E - \frac{\mathbf{p}^2}{2m} + i\epsilon}. \tag{1}$$

2. In the ϕ^4 theory

$$\mathcal{L} = -\frac{1}{2}(\partial\phi)^2 - \frac{m^2}{2}\phi^2 - \frac{\lambda}{4!}\phi^4 \tag{2}$$

give the Feynman graphs for the “two-point function” with up to 2 interaction vertices. Work out the expressions in coordinate space for these graphs. The “two-point function” means $\langle 0|T\phi(x_1)\phi(x_2)|0\rangle$, with interacting fields.

3. What are the symmetry factors for each of the diagrams below. (They are each in ϕ^4 theory, with a single component real field.) It is sufficient just to state the symmetry factor (e.g., “1/4”) for each graph.



4. Write a momentum-space expression for graphs (c) and (e) of the previous problem. (You will need to define names for the external momenta.)