

Physics 722, Spring 2021

Problem Set 8

Due Thursday, April 15.

1. *Functional Integral for Complex Scalar field*

The functional integral for the complex scalar field can be represented as an integral over $\phi(x)$ and $\bar{\phi}(x)$ independently, or as an integral over the real and imaginary parts of $\phi(x)$.

Using functional integrals for a free complex scalar field $\phi(x)$ with mass m , calculate the following correlation functions:

$$\langle 0|\phi(x)|0\rangle, \langle 0|T[\phi(x)\phi(y)]|0\rangle, \langle 0|T[\bar{\phi}(x)\bar{\phi}(y)]|0\rangle, \langle 0|T[\phi(x)\bar{\phi}(y)]|0\rangle$$