Assessment 7

1. The Dirac function in the context of a field in $\mathbb{R}^d$ space is defined by:
   \[ \delta(x) = \frac{1}{(2\pi)^{d/2}} \int e^{-\frac{x^2}{2}} \, dx. \]

2. A free field in $\mathbb{R}^d$ space is defined by the action $\int \phi(x) \frac{1}{2} \nabla^2 \phi(x) \, dx$. The expression for normalization is:
   \[ \sqrt{\frac{d}{2\pi}} \int e^{\frac{-x^2}{2}} \, dx. \]
   Note of the above
   By the power of moment
   Correct Answer:
   \[ \sqrt{\frac{d}{2\pi}} \int e^{\frac{-x^2}{2}} \, dx. \]

3. A free field in $\mathbb{R}^d$ space is defined by the action $\int \phi(x) \frac{1}{2} \nabla^2 \phi(x) \, dx$. The expression for generating functional for the full Green's function $G_{\phi}(x)$ is:
   \[ \sqrt{\frac{d}{2\pi}} \int e^{\frac{-x^2}{2}} \, dx. \]
   Note of the above
   By the power of moment
   Correct Answer:
   \[ \sqrt{\frac{d}{2\pi}} \int e^{\frac{-x^2}{2}} \, dx. \]

4. A free field in $\mathbb{R}^d$ space is defined by the action $\int \phi(x) \frac{1}{2} \nabla^2 \phi(x) \, dx$. The expression for the field function $\phi(x)$ is:
   \[ \sqrt{\frac{d}{2\pi}} \int e^{\frac{-x^2}{2}} \, dx. \]
   Note of the above
   By the power of moment
   Correct Answer:
   \[ \sqrt{\frac{d}{2\pi}} \int e^{\frac{-x^2}{2}} \, dx. \]

5. Which of the following is a candidate for the action integral $S$ of an interacting field defined in $d$-dimensional spacetime:
   \[ S_{\phi} = \frac{1}{2} \int \left[ \frac{\partial \phi(x)}{\partial x_\mu} \frac{\partial \phi(x)}{\partial x_\nu} - \frac{\partial^2 \phi(x)}{\partial x_\mu \partial x_\nu} \right] \, dx. \]
   Note of the above
   By the power of moment
   Correct Answer:
   \[ S_{\phi} = \frac{1}{2} \int \left[ \frac{\partial \phi(x)}{\partial x_\mu} \frac{\partial \phi(x)}{\partial x_\nu} - \frac{\partial^2 \phi(x)}{\partial x_\mu \partial x_\nu} \right] \, dx. \]

6. The Dirac function in the context of a field in $\mathbb{R}^d$ space is defined by:
   \[ \delta(x) = \frac{1}{(2\pi)^{d/2}} \int e^{-\frac{x^2}{2}} \, dx. \]
   Note of the above
   By the power of moment
   Correct Answer:

7. Consider $\phi$ theory in $\mathbb{R}^d$ space with the action $S = \int \frac{1}{2} \nabla^2 \phi$ + $\frac{1}{2} \phi M \phi$. The propagator $\langle \phi(x) \phi(x') \rangle$ is given by:
   \[ \langle \phi(x) \phi(x') \rangle = \frac{1}{(2\pi)^{d/2}} \int e^{-\frac{(x-x')^2}{2}} \, dx. \]
   Note of the above
   By the power of moment
   Correct Answer:
   \[ \langle \phi(x) \phi(x') \rangle = \frac{1}{(2\pi)^{d/2}} \int e^{-\frac{(x-x')^2}{2}} \, dx. \]