Unit 5 - Week 3

Course outline

How does an NPTEL online course work?
Week 0
Week 1
Week 2
Week 3
- Diffusion Equation Path Integral (1)
- Diffusion Equation Path Integral (2), Autocorrelators
- Schrodinger Equation Path Integral, Langevin Equation
- Langevin Equation
- Statistical Formalism of Path Integral
- Quiz : Assessment 3
- Solution : Assignment 3

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Assessment 3

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2020-10-07, 23:59 IST.

1) The value of $\lim_{n\to\infty}\left(1-\frac{3k^2}{6n}\right)^n$ is: *1 point*

- $\left(1-\frac{k^2}{2}\right)$
- $\exp\left(1-\frac{k^2}{2}\right)$
- $\exp\left(-\frac{k^2}{2}\right)$
- $\left(-\frac{k^2}{2}\right)$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\exp\left(-\frac{k^2}{2}\right)$

2) A solution of the diffusion equation $\frac{\partial P(x,t)}{\partial t}=\frac{D}{2}\frac{\partial^2 P(x,t)}{\partial x^2}$ is: *1 point*

- $P(x,t)=\frac{1}{\sqrt{2\pi Dt}}e^{-\frac{x^2}{2Dt}}$
- $P(x,t)=\frac{1}{\sqrt{2\pi t}}e^{-\frac{x^2}{2Dt}}$
- $P(x,t)=\frac{1}{\sqrt{2\pi t}}e^{-\frac{x^2}{2D^2t^2}}$
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
$P(x,t)=\frac{1}{\sqrt{2\pi Dt}}e^{-\frac{x^2}{2Dt}}$

3) The value of $\int_{-\infty}^{\infty} f(x)\delta(x-a)dx$ is: *1 point*

- 1
- $f(a)$
- 0
- $f(0)$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$f(a)$

4) The value of $\int_{-\infty}^{\infty} dy\exp\left(-ay^2+by\right)$ is: *1 point*

- $\exp\left(\frac{b^2}{4a}\right)$
- $\sqrt{\frac{a}{2\pi}}\exp\left(\frac{b^2}{4a}\right)$
- $\sqrt{\frac{\pi}{a}}\exp\left(\frac{b^2}{4a}\right)$
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\sqrt{\frac{\pi}{a}}\exp\left(\frac{b^2}{4a}\right)$

5) Consider the equation of motion of a particle $\frac{dV_t}{dt}+\gamma V_t=0$ where V_t is the velocity of the particle at time t and $\gamma>0$. The asymptotic $(t\to\infty)$ value of the velocity approaches: *1 point*

- The initial velocity V_0
- 0
- The velocity becomes unbounded as $t\to\infty$
- $e^{-\gamma}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
0

6) Consider Brownian particles who dynamics are governed by the Langevin equation: $m\frac{dV}{dt}=\sqrt{\Gamma}\eta(t)$ immersed in a fluid where the right hand side represents a fluctuating force that obeys $\langle\eta(t)\rangle=0$ and $\langle\eta(t)\eta(t')\rangle=\delta(t-t')$. The average velocity over particles that have an initial velocity of V_0 in the limit $t\to\infty$ is: *1 point*

- The initial velocity V_0
- 0
- The velocity becomes unbounded as $t\to\infty$
- $\exp(-\Gamma t)$

No, the answer is incorrect.
Score: 0
Accepted Answers:
The initial velocity V_0

7) The Fourier transform of $\delta(x)$, ignoring the normalization factor, is: *1 point*

- $1/k$
- 1
- 0
- $\exp(-ikx)$

No, the answer is incorrect.
Score: 0
Accepted Answers:
1

8) The characteristic function of a distribution is given by: $C_x(k)=\exp\left(-2k^2\right)$
Its probability density function $p(x)$ is: *1 point*

- $p(x)=\frac{1}{\sqrt{2\pi}}\exp\left(-\frac{x^2}{4}\right)$
- $p(x)=\frac{2}{\sqrt{2\pi}}\exp\left(-\frac{x^2}{4}\right)$
- $p(x)=\frac{1}{2\sqrt{2\pi}}\exp\left(-\frac{x^2}{8}\right)$
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
$p(x)=\frac{1}{2\sqrt{2\pi}}\exp\left(-\frac{x^2}{8}\right)$

9) The cumulant generating function of a Gaussian random variable X is $K_x(t)=2t+8t^2$. Its second moment about the origin $E\left(X^2\right)$ is: *1 point*

- 2
- 20
- 16
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
20

10) The value of $\Gamma\left(-\frac{3}{2}\right)$ is: *1 point*

- $\frac{4}{3}\sqrt{\pi}$
- $\frac{\sqrt{\pi}}{2}$
- $-\frac{2}{3}\sqrt{\pi}$
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\frac{4}{3}\sqrt{\pi}$