Unit 3 - Week 1

Course outline

How does an NPTEL online course work?

Week 0

Week 1

- Setting The Scene
- Introduction to the Path Integral
- Probability Fundamentals, Generating Functions
- Generating Functions, Gaussian Distribution
- Gaussian Distribution, Gaussian Integration
- Quiz : Assignment 1
- Solution : Assignment 1

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FFEEDBACK

Assignment 1

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

Due on 2020-09-30, 23:59 IST.

1) Consider a binomial distribution with n=10 & p=0.25. The second cumulant of the distribution is: *1 point*

- 0.625
- 0.1875
- 1.875
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
1.875

2) Let $X_1, X_2, \ldots, X_n$ be n independent Gaussian random variables with zero means and respective standard deviations of $\sigma_i; i = 1, 2, \ldots, n$. We define the random variable $S_n = \sum_{i=1}^{n} aX_i$. Then, the variable S_n is: *1 point*

- Distributed as the standard normal variable N(0,1)
- Uniformly distributed over the interval (0,1) with a mean of zero and a standard deviation of 1/12
- Distributed as the normal variable $\mathcal{N}\left(0, \sum_{i=1}^{n} a\sigma_i\right)$
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
None of the above

3) The moment generating function of a binomial distribution is: $M_X(t) = (0.75e^t + 0.25)^6$. The second moment of the distribution about the origin is: *1 point*

- 1.125
- 21.375
- 16.875
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
21.375

4) The value of $\int_{-\infty}^{+\infty} e^{-a^2 y^2} dy$ is: *1 point*

- $\frac{\sqrt{\pi}}{a}$
- 1
- $\sqrt{2\pi}$
- None of the above

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

5) The moment generating function of a Gaussian distribution is $M_X(t) = 2t + 4t^2$. Its probability density function is: *1 point*

- $p(x) = \frac{1}{\sqrt{2\pi}} \exp\left[-\frac{(x-2)^2}{2}\right]$
- $p(x) = \frac{1}{\sqrt{2\pi}} \exp\left[-\frac{(x-2)^2}{16}\right]$
- $p(x) = \frac{1}{\sqrt{16\pi}} \exp\left[-\frac{(x-2)^2}{16}\right]$
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
$p(x) = \frac{1}{\sqrt{16\pi}} \exp\left[-\frac{(x-2)^2}{16}\right]$

6) $Lim_{n\to\infty}\left(1 - \frac{Dk^2 t}{n}\right)^n$ is: *1 point*

- $\exp(-Dk^2 t)$
- $\exp(-Dt)$
- 1
- $\exp(1)$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\exp(-Dk^2 t)$

7) The expected value of Z^4 where Z is the standard normal variable $\mathcal{N}(0,1)$ is: *1 point*

- 3
- 6
- 0
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
3

8) Which of the following is a Stirling's approximation for *n!* for large values of *n*? *1 point*

- $\sqrt{2\pi}n^{\left(n+\frac{1}{2}\right)}e^{-n}$
- $\sqrt{2\pi}n^{\left(n+\frac{1}{2}\right)}e^{n}$
- $\sqrt{2\pi}n^2 e^{-n}$
- $\sqrt{2\pi}n^{-\left(n+\frac{1}{2}\right)}e^{n}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\sqrt{2\pi}n^{\left(n+\frac{1}{2}\right)}e^{-n}$

9) A random variable *X* can take on the values *+1* and *-1*, with respective probabilities α and 1-α, where $0<\alpha<1$. The characteristic function of *X* is: *1 point*

- $\tilde{p}(k) = \alpha e^{-ik} - \alpha e^{ik}$
- $\tilde{p}(k) = (e^{-ik} + e^{ik})$
- $\tilde{p}(k) = \alpha(e^{-ik} + e^{ik}) + (1-\alpha)(e^{-ik} - e^{ik})$
- $\tilde{p}(k) = \alpha e^{-ik} + (1-\alpha)e^{ik}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\tilde{p}(k) = \alpha e^{-ik} + (1-\alpha)e^{ik}$

10) The moment generating function of the random variable *X* is given by $f(t) = E(t^X) = \langle t^X \rangle$, where the average or expectation is over all realizations of the random variable. Let *Y* be the random variable $Y = kX + l$, where *k* and *l* are given positive integers. In terms of *f*, the moment generating function $\phi(t)$ of *Y* is: *1 point*

- $\phi(t) = t^l f(t^k)$
- $\phi(t) = t^l f(t)$
- $\phi(t) = f(t^k)$
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\phi(t) = t^l f(t^k)$