CA5 - Normal Distribution, Moment Generating Functions, Law of Large Numbers, and Central Limit...

Add Instructions...

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1   Multiple Choice   5 points

X is a random variable with mean $E[X] = \mu$ and variance $Var(X) = \sigma^2$. We standardize X to get the new random variable Z:

$$Z = \frac{X - \mu}{\sigma}$$

What are the **mean** and **variance**, respectively, of Z?

- ● 0, 1
- ○ 2, 1
- ○ 1, 0
- ○ 2, 0

2   Multiple Choice   3 points

Suppose X is normally distributed with mean 5 and standard deviation 0.4. Using the standard transformation $Z = \frac{X-\mu}{\sigma}$, we find $P(X \le X_0) = P(Z \le 1.3)$.

What is the value of X_0?

○ 6.9

○ 4.48

○ 2.00

◉ 5.52

3   True or False   2 points

If $X_1, X_2, ..., X_n$ are independent identically distributed random variables with mean μ and variance σ^2.
We define the sample mean to be:

$$\overline{X} = \frac{X_1 + X_2 + ... + X_n}{n}$$

The following statement is True or False?
The value of the standard deviation of the sample mean $\overline{X}$ is always greater than the standard deviation of the population, i.e., σ.

○ True

● False

4   Multiple Choice   5 points

Suppose that $X \sim N(2, 1)$ and $Y \sim N(3, 2)$. Assuming that X and Y are independent, what is the distribution of $X + Y$?

○ $N(3, 5)$

● $N(5, 3)$

○ $N(3, 3)$

○ $N(5, 5)$

Suppose $X \sim N(5, 9)$. What is $P(X \leq 8)$ in terms of the standard normal random variable $Z \sim N(0, 1)$?

- ● $P(Z \leq 1)$
- ○ $P(Z \leq -1)$
- ○ $P(Z \leq 0.6)$
- ○ $P(Z \leq -0.6)$
- ○ $P(Z \leq 1.67)$