1. Which term describes a collection of random variables grouped together as a single entity?

A) Cumulative distribution function
B) Vector random variables
C) Marginal distribution
D) Central limit theorem

Answer: B) Vector random variables

Explanation: Vector random variables refer to a collection of random variables grouped together as a single entity, often represented as a vector.

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2. What does the joint distribution function describe?

A) The distribution of individual random variables
B) The relationship between two random variables
C) The probability distribution of a single random variable
D) The distribution of multiple random variables simultaneously

Answer: D) The distribution of multiple random variables simultaneously

Explanation: The joint distribution function describes the probability distribution of multiple random variables considered together.

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3. Which property does not apply to joint distribution functions?

A) Symmetry
B) Normalization
C) Independence
D) Monotonicity

Answer: D) Monotonicity

Explanation: Joint distribution functions need not exhibit monotonicity; however, they should satisfy symmetry, normalization, and independence properties under certain conditions.

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4. What does the marginal distribution function represent?

A) The distribution of variables at the extreme ends
B) The distribution of variables considered individually
C) The relationship between two random variables
D) The conditional probability of one variable given another

Answer: B) The distribution of variables considered individually

Explanation: Marginal distribution functions represent the probabilities associated with

individual random variables, ignoring the other variables.

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5. In the context of multiple random variables, what does statistical independence imply?

A) The variables are identically distributed
B) The variables are linearly related
C) The variables have no influence on each other
D) The variables have the same mean

Answer: C) The variables have no influence on each other

Explanation: Statistical independence between multiple random variables means that the occurrence or value of one variable does not affect the occurrence or value of another.

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6. According to the Central Limit Theorem, what happens as the sample size increases?

A) The sample mean approaches the population mean
B) The sample variance decreases
C) The distribution becomes skewed
D) The standard deviation remains constant

Answer: A) The sample mean approaches the population mean

Explanation: The Central Limit Theorem states that as the sample size increases, the distribution of the sample mean approaches a normal distribution centered around the population mean.

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7. When considering unequal distributions, what aspect differs among the random variables?

A) Mean
B) Variance
C) Skewness
D) Kurtosis

Answer: B) Variance

Explanation: Unequal distributions among random variables imply differences in their variances while their means may or may not differ.

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8. What does the expected value of a function of random variables represent?

A) The average value of the function
B) The probability of the function occurring
C) The maximum value of the function
D) The minimum value of the function

Answer: A) The average value of the function

Explanation: The expected value of a function of random variables represents the average value that the function would take over all possible outcomes.

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9. What are joint moments about the origin used to compute?

A) Individual variable’s moments
B) Moments of the entire distribution
C) Variance of the distribution
D) Skewness of the distribution

Answer: B) Moments of the entire distribution

Explanation: Joint moments about the origin are used to compute moments of the entire distribution formed by multiple random variables.

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10. What do joint characteristic functions describe?

A) The relationship between two random variables
B) The distribution of a single random variable
C) The behavior of multiple random variables under linear transformations

D) The probability distribution of multiple random variables

Answer: D) The probability distribution of multiple random variables

Explanation: Joint characteristic functions describe the probability distribution of multiple random variables.

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11. In the context of jointly Gaussian random variables, what property characterizes their distribution?

A) Uniformity
B) Normality
C) Exponentiality
D) Bimodality

Answer: B) Normality

Explanation: Jointly Gaussian random variables follow a multivariate normal distribution.

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12. What transformations are considered for multiple random variables?

A) Non-linear transformations

B) Linear transformations
C) Exponential transformations
D) Logarithmic transformations

Answer: B) Linear transformations

Explanation: Linear transformations are often considered for multiple random variables, especially in the context of Gaussian distributions.

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13. Which transformation is specifically considered for Gaussian random variables?

A) Exponential transformations
B) Logarithmic transformations
C) Linear transformations
D) Polynomial transformations

Answer: C) Linear transformations

Explanation: Linear transformations are particularly relevant for Gaussian random variables due to their preservation of Gaussianity under linear operations.

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14. In the context of multiple random variables, what does the term “central moments” refer

to?

A) Moments about the origin
B) Moments about the mean
C) Moments about the median
D) Moments about the mode

Answer: B) Moments about the mean

Explanation: Central moments are moments about the mean of the distribution.

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15. What property characterizes jointly Gaussian random variables in terms of their linear combinations?

A) They follow a non-Gaussian distribution
B) They exhibit non-linear relationships
C) They preserve Gaussianity
D) They become independent

Answer: C) They preserve Gaussianity

Explanation: Linear combinations of jointly Gaussian random variables preserve Gaussianity, meaning the resulting distribution remains Gaussian.

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16. What term describes the distribution of the sum of two random variables?

A) Convolution
B) Transformation
C) Integration
D) Differentiation

Answer: A) Convolution

Explanation: The distribution of the sum of two random variables can be calculated using convolution.

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17. What property characterizes equal distributions among random variables?

A) Identical mean and variance
B) Different mean and variance
C) Identical skewness and kurtosis
D) Different skewness and kurtosis

Answer: A) Identical mean and variance

Explanation: Equal distributions among random variables imply that they have the same

mean and variance.

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18. Which distribution is commonly associated with jointly Gaussian random variables?

A) Uniform distribution
B) Exponential distribution
C) Normal distribution
D) Poisson distribution

Answer: C) Normal distribution

Explanation: Jointly Gaussian random variables follow a multivariate normal distribution.

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19. What is the purpose of conditional distribution and density in interval conditioning?

A) To find the mean of the distribution
B) To calculate the variance of the distribution
C) To determine probabilities within a specific range
D) To assess the mode of the distribution

Answer: C) To determine probabilities within a specific range

Explanation: Conditional distribution and density in interval conditioning help determine probabilities within a specified range given certain conditions.

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20. In what scenario would point conditioning be applicable?

A) When the variables have continuous values
B) When the variables have discrete values
C) When the variables are independent
D) When the variables are identically distributed

Answer: A) When the variables have continuous values

Explanation: Point conditioning is typically applicable when dealing with continuous random variables and involves conditioning on a specific value rather than a range.