Assignment 6

3 points

The following statements are true or false. Explain your answer.

1. For a random variable X with mean μ and standard deviation σ, the cumulative distribution function (CDF) is given by F(x) = P(X ≤ x) = \frac{1}{σ\sqrt{2π}} \int_{-∞}^{x} e^{-\frac{1}{2} \left( \frac{t-μ}{σ} \right)^2} dt.

2. If X is a binomial random variable with parameters n and p, then E(X) = np and Var(X) = np(1-p).

3. The variance of the sum of independent random variables is equal to the sum of their variances.

4. If X and Y are independent normal random variables, then Z = X + Y is also normally distributed.

5. If X is a continuous random variable with probability density function f(x), then the median of X is the value x such that P(X ≤ x) = 0.5.

6. If X is a uniformly distributed random variable on the interval [a, b], then P(X = c) = 0 for all c \in [a, b].

7. The expected value of a random variable is always greater than or equal to its variance.

8. If X is a discrete random variable with probability mass function p(x), then E(X) = \sum_{x} x \cdot p(x).

9. If X is a Poisson random variable with parameter λ, then the mean and variance of X are both equal to λ.

10. If X and Y are independent random variables, then Cov(X, Y) = 0.

11. If X and Y are two random variables, then the covariance of X with itself (Cov(X, X)) is its variance.

12. If X is a normal random variable, then the probability of X exceeding its mean plus two standard deviations is less than 0.025.

13. If X is a lognormal random variable, then the logarithm of X is normally distributed.

14. If X is a gamma random variable with parameters α and θ, then the mean of X is αθ.

15. If X is a chi-squared random variable with n degrees of freedom, then E(X) = n.

16. If X is a binomial random variable with parameters n and p, then the probability of exactly k successes in n trials is given by P(X = k) = \binom{n}{k} p^k (1-p)^{n-k}.

17. If X is an exponential random variable with parameter λ, then the mean of X is 1/λ.

18. If X is a uniform random variable on the interval [a, b], then the median of X is (a + b) / 2.

19. If X is a normal random variable with mean μ and variance σ², then the probability density function of X is given by f(x) = \frac{1}{\sqrt{2πσ^2}} e^{-\frac{(x-μ)^2}{2σ^2}}.

20. If X is a geometric random variable with parameter p, then the expected value of X is 1/(1-p).

21. If X is a binomial random variable with parameters n and p, then the variance of X is np(1-p).

22. If X is a Poisson random variable with parameter λ, then the variance of X is equal to λ.

23. If X is a normal random variable with mean μ and variance σ², then the probability that X is between a and b is given by P(a < X < b) = \int_{a}^{b} \frac{1}{\sqrt{2πσ^2}} e^{-\frac{(x-μ)^2}{2σ^2}} dx.

24. If X is a uniform random variable on the interval [a, b], then the expected value of X is (a + b) / 2.

25. If X is a binomial random variable with parameters n and p, then the expected value of X is np.

26. If X is a Poisson random variable with parameter λ, then the variance of X is equal to λ.

27. If X is a normal random variable with mean μ and variance σ², then the probability that X is less than a is given by P(X < a) = \int_{-∞}^{a} \frac{1}{\sqrt{2πσ^2}} e^{-\frac{(x-μ)^2}{2σ^2}} dx.

28. If X is a uniform random variable on the interval [a, b], then the expected value of X is (a + b) / 2.

29. If X is a binomial random variable with parameters n and p, then the expected value of X is np.

30. If X is a Poisson random variable with parameter λ, then the variance of X is equal to λ.

31. If X is a normal random variable with mean μ and variance σ², then the probability that X is greater than a is given by P(X > a) = \int_{a}^{∞} \frac{1}{\sqrt{2πσ^2}} e^{-\frac{(x-μ)^2}{2σ^2}} dx.

32. If X is a uniform random variable on the interval [a, b], then the expected value of X is (a + b) / 2.

33. If X is a binomial random variable with parameters n and p, then the expected value of X is np.

34. If X is a Poisson random variable with parameter λ, then the variance of X is equal to λ.

35. If X is a normal random variable with mean μ and variance σ², then the probability that X is between a and b is given by P(a < X < b) = \int_{a}^{b} \frac{1}{\sqrt{2πσ^2}} e^{-\frac{(x-μ)^2}{2σ^2}} dx.

36. If X is a uniform random variable on the interval [a, b], then the expected value of X is (a + b) / 2.

37. If X is a binomial random variable with parameters n and p, then the expected value of X is np.

38. If X is a Poisson random variable with parameter λ, then the variance of X is equal to λ.

39. If X is a normal random variable with mean μ and variance σ², then the probability that X is less than a is given by P(X < a) = \int_{-∞}^{a} \frac{1}{\sqrt{2πσ^2}} e^{-\frac{(x-μ)^2}{2σ^2}} dx.

40. If X is a uniform random variable on the interval [a, b], then the expected value of X is (a + b) / 2.