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Sample Test 2 questions:

- (1) Let X be a Poisson random variable with $\mathbb{E}X = 4$. Find the formula for $\mathbb{P}(2 \leq X \leq 5)$.
- (2) Let X be a binomial random variable with $\mathbb{E}X = 4$ and $n = 10$. Find the formula for $\mathbb{P}(2 \leq X \leq 5)$.
- (3) Let X be the number of coin tosses until we have one head. Find $\mathbb{E}X$ and $\text{Var}X$. Find $\mathbb{P}(X \geq 3)$

- (4) Suppose X has the following p.d.f.

$$f(x) = \begin{cases} ax^2 & \text{if } 1 \leq x \leq 2 \\ 0 & \text{otherwise} \end{cases}$$

Find a , $\mathbb{E}X$, $\text{Var}X$, and the cdf $F(x)$. Make a picture of the p.d.f. and c.d.f.

- (5) Suppose X has the following p.d.f.

$$f(x) = \begin{cases} \frac{a}{x^2} & \text{if } 1 \leq x \leq 3 \\ 0 & \text{otherwise} \end{cases}$$

Find a , $\mathbb{E}X$, $\text{Var}X$, and the cdf $F(x)$. Make a picture of the p.d.f. and c.d.f.

- (6) Find the numerical value for $\mathbb{P}(-2 \leq X \leq 3)$ if X is $\mathcal{N}(3, 4)$. Your answer should include Φ twice. After that, use the normal table attached in the end of the quiz find the approximate answer.
- (7) Find a formula for $\mathbb{P}(-2 \leq X \leq 3)$ if X is $\mathcal{N}(-3, 4)$. Your answer should include Φ twice. After that, use the normal table attached in the end of the quiz find the approximate answer.
- (8) If Z_1 and Z_2 are standard normal independent random variables, and $X = 3Z_1 + 4Z_2$, find $\mathbb{P}(-2 \leq X \leq 3)$. Your answer should include Φ twice. After that, use the normal table attached in the end of the quiz find the approximate answer.
- (9) Let X be a binomial random variable with $\mathbb{E}X = 60$ and $n = 150$. Find the normal approximation for $\mathbb{P}(54 \leq X \leq 72)$.
- (10) Let X be the number of tails in 25 fair coin tosses. Find the best normal approximation for $\mathbb{P}(X \leq 15)$.
- (11) Let a fair dice be thrown 2000 times. Find the normal approximation of the probability that 6 appears at least 300 times.

(12) Let X be an exponential random variable with parameter $\lambda = 2$. Find

- (a) Find $P(X > 3)$
- (b) Find $P(X > 3|P > 2)$
- (c) Find $P(4 < X < 6|P > 2)$

(13) Let X be a uniform random variable on $[1, 5]$. Find

- (a) Find $P(X > 3)$
- (b) Find $P(X > 3|P > 2)$
- (c) Find $P(4 < X < 6|P > 2)$
- (d) Find $\mathbb{E}e^{2X}$.
- (e) Find $\mathbb{E}\frac{1}{X^2}$.

(14) Consider random variables X and Y with the joint probability density function

$$f(x, y) = \begin{cases} axy^2 & \text{if } 0 \leq x \leq y \leq 2 \\ 0 & \text{otherwise.} \end{cases}$$

- (a) Find a
- (b) Find the marginal p.d.f. $f_X(x)$.
- (c) Find the marginal p.d.f. $f_Y(y)$.

(15) Consider random variables X and Y with the joint probability density function

$$f(x, y) = \begin{cases} axy^2 & \text{if } 0 \leq y \leq x \leq 2 \\ 0 & \text{otherwise.} \end{cases}$$

- (a) Find a
- (b) Find the marginal p.d.f. $f_X(x)$.
- (c) Find the marginal p.d.f. $f_Y(y)$.

(16) Consider random variables X and Y with the joint probability density function

$$f(x, y) = \begin{cases} axy^2 & \text{if } 0 \leq x, 0 \leq y, x + y < 2 \\ 0 & \text{otherwise.} \end{cases}$$

- (a) Find a
- (b) Find the marginal p.d.f. $f_X(x)$.
- (c) Find the marginal p.d.f. $f_Y(y)$.