

Practice Final

Botao Jin

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Part 1

Refer to the following exercises in the textbook: 3.37, 3.67, 5.10, 5.22, 6.6, 6.10, 6.32, 8.6, 8.13

Part 2

Check out these additional exercises:

1. Suppose that X_1 and X_2 are independent random variables, and X_1 and X_2 have the exponential distribution with parameters β_1 and β_2 , respectively. Then, for each constant $k > 0$,
 - (a) Identify the distribution of $\min\{X_1, kX_2\}$.
 - (b) Show that the probability

$$P(X_1 > kX_2) = \frac{\beta_2}{k\beta_1 + \beta_2}$$

2. Suppose that a sequence of independent tosses are made with a coin for which the probability of obtaining a head on each given toss is $1/30$.
 - (a) What is the expected number of tosses that will be required in order to obtain five heads?
 - (b) What is the variance of the number of tosses that will be required in order to obtain five heads?
3. Suppose that a book with n pages contains on the average λ misprints per page. What is the probability that at least one page which contains exactly k misprints?
4. Let X have a density function

$$f(x) = \begin{cases} cx^2e^{-4x} & x > 0 \\ 0 & \text{Otherwise} \end{cases}$$

- (a) Find the value of c that makes f a valid density?
 - (b) Calculate the mean and variance of $\frac{1}{X}$.
5. Suppose that Y is a random variable with mean 10 and variance 2. Let X be a random variable with moment generating function $M_X(t) = \frac{1}{27}(2e^t + 1)^3 M_Y(t)$, where $M_Y(t)$ is the moment generating function Y , then calculate the mean and variance of X . (Hint: If two random variables have the same moment generating function, then they have the same distribution. Now, you can consider a random variable $Z \sim \text{Bin}(3, 2/3)$, which is independent of Y)
 6. Let the random variables X, Y have joint density

$$f(x, y) = \begin{cases} 3(2-x)y & \text{if } 0 < y < 1 \text{ and } y < x < 2-y \\ 0 & \text{otherwise} \end{cases}$$

- (a) Verify that it is a valid joint density function.
- (b) Calculate

$$P(X + Y \leq 1)$$

Note: This study guide is used for Botao Jin's sections only. Comments, bug reports: b_jin@ucsb.edu