

CSE 312 : Autumn 2025 Quiz 3 Form 1

Name:

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Instructions

- You have twenty minutes to complete this exam.
- You are permitted one piece of 8.5x11 inch paper with handwritten notes (notes are allowed on both sides of the paper). You should also get a provided formula sheet.
- You may not use a calculator or any other electronic devices during the exam.
- We will be scanning your exams before grading them. Please write legibly, and avoid writing up to the edge of the paper.
- If you run out of room, you may also use the last page for extra space, but tell us where to find your answer if it's not right below the problem.
- Since you don't have a calculator, you are generally free to **not** simplify expressions (though you may if you think it will be helpful).
- In general, you should show us the work you used to get to an answer, and explanations will help us reward partial credit, but we do **not** expect explanations at the level we usually require on homeworks.

Advice

- Writing a few words about where an expression came from is often very helpful for awarding partial credit.
- Remember to take deep breaths.

Question	Max points
Short Answer	22
Multiple Choice	3
Total	25

There are no problems on this page, go to the next one.

1. Short Answer Questions

(a) Suppose I have a random variable X whose PDF is

$$f_X(x) = \begin{cases} ce^{cx} & 0 \leq x \leq 2 \\ 0 & \text{otherwise} \end{cases}$$

Compute the value of c that makes this a valid PDF. [4 points]

(b) Let X be a random variable with PDF

$$f_X(x) = \begin{cases} x/4 & 1 \leq x \leq 3 \\ 0 & \text{otherwise} \end{cases}$$

Compute the expectation of X . For this part, an answer is considered fully simplified if someone with a calculator but no knowledge of calculus could get an exact number. [4 points]

(c) As in the previous part, let

$$f_X(x) = \begin{cases} x/4 & 1 \leq x \leq 3 \\ 0 & \text{otherwise} \end{cases}$$

Compute the variance of X , and leave your answer in terms of b , your answer for the expectation of X from the previous part. Again, an answer is considered fully simplified if someone with a calculator (and knowledge of b) but no knowledge of calculus could get an exact number. [4 points]

(d) An ant of negligible size is located on a line (with negligible width) of length 10. The ant is placed uniformly randomly on the line. Let X be the distance of the ant to the nearest endpoint of the line. Compute the CDF of X , $F_X(x)$. Don't forget to include all cases! [4 points]

$$F_X(x) = \left\{ \begin{array}{l} \end{array} \right.$$

- (e) Let Y be a normal random variable with mean 10 and variance 16. Write $\mathbb{P}(2 \leq Y \leq 18)$ in terms of $\Phi(\cdot)$, the CDF of a $\mathcal{N}(0, 1)$ random variable. [6 points]



2. Multiple Choice

- (a) Let $X \sim \text{Unif}(1, 10)$ be a continuous RV and $Y \sim \text{Unif}(1, 10)$ be a **discrete** RV. Which of the following are (always) true? Mark ALL that apply. [3 points]

Hint: Remember you have a reference sheet!

- $\mathbb{E}[X] = \mathbb{E}[Y]$
- $\Omega_X = \Omega_Y$
- $\mathbb{P}[X < 10] = \mathbb{P}[Y < 10]$
- $\mathbb{P}[X > 10] = \mathbb{P}[Y > 10]$