

Do not open the packet until the exam begins. When it begins, please rip this page off your exam.

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.
- 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.

Simplification Expectations

- Since you don't have a calculator for this exam, you do not have to do simplifications that could be done easily with a scientific calculator. For example, the expression below is simplified enough to be a final answer.

$$\frac{\binom{5}{3} \cdot 17^2}{1-p} + 5^3$$

- However, answers which are much more complicated than the expected answer may receive deductions. For example:
 - $\sum_{i=0}^n \binom{n}{i}$ or $\binom{n}{0} + \binom{n}{1} + \binom{n}{2} + \dots + \binom{n}{n}$ are **not** simplified sufficiently
 - $\int_1^3 x^3 dx$ or $(2t^3)|_0^x$ are **not** simplified sufficiently

Generally derivatives, integrals, summations, or “...” are not sufficiently simple, unless otherwise indicated.

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	25
Total	25

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

CSE 312 : Autumn 2025 Quiz 3 Retake Form 1

Name:

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1. Short Answer Questions [25 points]

(a) Let X be a random variable with PDF

$$f_X(x) = \begin{cases} \frac{x^2}{c} & 1 \leq x \leq 7 \\ 0 & \text{otherwise} \end{cases}$$

What value of c would make this a valid pdf?

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]

(b) Let X be a random variable with PDF

$$f_X(x) = \begin{cases} x/16 & 2 \leq x \leq 6 \\ 0 & \text{otherwise} \end{cases}$$

Find the CDF $F_X(x)$. Be sure to include all cases. [4 points]

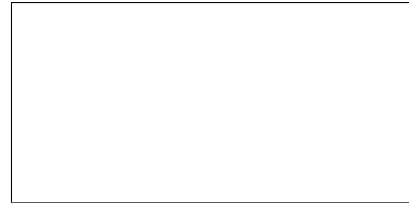
$$F_X(x) = \left\{ \begin{array}{l} \\ \\ \\ \end{array} \right.$$

(c) As in the previous part, let

$$f_X(x) = \begin{cases} x/16 & 2 \leq x \leq 6 \\ 0 & \text{otherwise} \end{cases}$$

Compute $\mathbb{E}[4X^2]$.

Again, an answer is considered fully simplified if someone with a calculator but no knowledge of calculus could get an exact number. [4 points]



(d) You are throwing a dart at a circle dartboard with radius 5. You are very good, so your dart always lands on the board. Assume that it is equally likely for a dart to land anywhere on the board. Let X be the shortest distance from the dart to the edge of the board.

Compute the CDF of X , $F_X(x)$. Be sure to include all cases of the CDF. [5 points]

Hint: The shortest distance from the dart to the edge is the radius – the distance to the middle.

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

(e) Let X be a normal random variable with mean 120 and variance 16, and let Y be a normal random variable with mean 90 and variance 9. Assume X and Y are independent. Let $W = X - Y$ be the difference.

Find $\mathbb{E}[W]$ and $\text{Var}(W)$, and list them in the blanks below.

Then, in the box, write $\mathbb{P}(W \geq 18)$ in terms of $\Phi(\cdot)$, the CDF of a $\mathcal{N}(0, 1)$ random variable. [8 points]

$\mathbb{E}[Z] =$ _____ $\text{Var}(Z) =$ _____

