2024 Fall CSD3240/3241/SEM4108 - Probability and Statistics Homework 4

x

1. Suppose that X is a continuous random variable whose probability density function is given by

$$f(x) = \begin{cases} C(4x - 2x^2), & 0 < x < 2 \\ 0, & \text{otherwise} \end{cases}$$

integrate then find C. Use = 1

a) What is the value of C?

A) $\frac{3}{8}$ B) $\frac{1}{2}$ C) $\frac{2}{5}$ D) $\frac{1}{3}$

b) Find $P(X > 1)$.

Use C that was found then use 1 as lower and 2 as upper limit

A) $\frac{1}{5}$ B) $\frac{1}{4}$ C) $\frac{1}{3}$ D) $\frac{1}{2}$

2. The lifetime in hours of a certain kind of radio tube is a continuous random variable having a probability density function given by

$$f(x) = \begin{cases} 0, & x \leq 100 \\ \frac{100}{x^2}, & x > 100 \end{cases}$$

integrate and use binomial

What is the probability that exactly 2 of 5 such radio tubes will have to be replaced within the first 150 hours of operation? Assume that such a radio tubes will have to be replaced within this time are independent.

A) $\frac{1}{3}$ B) $\frac{2}{3}$ C) $\frac{80}{243}$ D) $\frac{8}{81}$

3. Buses arrive at a stop at 15-minute intervals starting at 7A.M. That is, they arrive at 7, 7:15, 7:30, 7:45, and so on. If a passenger arrives at the stop at a time that is uniformly distributed between 7 and 7:30, find the probability that he waits

use uniform distribution

a) less than 5 minutes for a bus

A) $\frac{2}{3}$ B) $\frac{1}{6}$ C) $\frac{1}{3}$ D) $\frac{1}{2}$

b) more than 10 minutes for a bus

A) $\frac{2}{3}$ B) $\frac{1}{3}$ C) $\frac{1}{6}$ D) $\frac{1}{2}$

4. If X is a normal random variable with parameters $\mu = 3$ and $\sigma^2 = 9$, find

a) $P(2 < X < 5)$

use standard normal

A) 0.8413 B) 0.0456 C) 0.1265 D) 0.3779

b) $P(|X - 3| > 6)$

mean is 3, and we know that x is 6 units away. This x is less than -3 and more than 9
With this info, we can go find the z value

A) 0.0456 B) 0.3779 C) 0.8413 D) 0.5971

5. An examination is often regarded as being good if the valid grade spread for those taking it is determined by a normal density function. The instructor often uses the test scores to estimate the normal parameters μ and σ^2 and then assigns the grade A to those whose score is greater than $\mu + \sigma$, grade B to those whose score is between μ and $\mu + \sigma$, grade C to those whose score is between $\mu - \sigma$ and μ, grade D to those whose score is between $\mu - 2\sigma$ and $\mu - \sigma$, and grade F to those getting score below $\mu - 2\sigma$.

a) How much percentage of the class will receive an A grade on the examination?

mean = 0
Stand dev = 1

X is what formula for each grade is

Do simple math aremithic to find the value of z for both question than bam, youll find the answer

A) 2.3% B) 15.9% C) 34.1% D) 13.6%

b) How much percentage of the class will fail (those who receive F grade) the examination?

A) 15.9% B) 34.1% C) 2.3% D) 13.6%

6. The amount of time, in hours, that a computer functions before breaking down is an exponential continuous random variable with parameter $\lambda = \frac{1}{100}$. What is the probability that a computer will function between 50 and 150 hours before breaking down

A) 0.279 B) 0.824 C) 0.384 D) 0.633

Insert the formula for exponential continuous and youll find the answer