

(Due Tuesday 02/19/2019 right before the class)

&

(Your homework shall be stapled if it contains multiple pages.)

SPRING/2019/MA526: HOMEWORK 3

Instructor: Guangqu Zheng¹; Grader: Chessa Mccalla²

Total points: 20

Q1 (4 points) An allergist claims that 50% of the patients she tests are allergic to some type of weed. What is the probability that

- (a) exactly 3 of her next 4 patients are allergic to weeds?
- (b) none of her next 4 patients is allergic to weeds?

Q2 (4 points) There is a test for Allergy to Cats/Dogs, but this test is not always right:

For people that really do have the allergy, the test says "Yes" 75% of the time and for people that do not have the allergy, the test says "Yes" 10% of the time ("false positive")

If 1% of the population have the allergy, and Amy's test says "Yes", what are the chances that Amy really has the allergy?

Q3 (6 points) probability mass/density function.

(a) Determine whether or not the following are probability mass function $f(x) = \frac{1}{4}(x^2 + 4)$, $x = 0, 1, 3$ and $f(x) = 0$ for other x .

(b) Find the value C such that the following function g is a **probability density function**:

$$g(x) = \begin{cases} C\sqrt{x} & \text{for } 0 < x < 2 \\ 0 & \text{elsewhere} \end{cases}$$

(c) Find the cumulative distribution function associated to g respectively in (b).

Recall that the CDF of a random variable X is defined as follows: $F(x) = \mathbb{P}(X \leq x)$

Q4 (6 pt)

(1) Suppose a random variable X has probability density function given by

$$f(x) = \begin{cases} x & \text{for } 0 < x < 1 \\ 2 - x & \text{for } 1 \leq x < 2 \\ 0 & \text{elsewhere} \end{cases}$$

Find the probability that X^2 is less than or equal to 1.21. (2 points)

(2) An investment firm offers its customers municipal bonds that mature after varying numbers of years. Given that the cumulative distribution function of T , the number of years to maturity for a randomly selected bond, is

$$F(t) = \begin{cases} 0 & \text{for } t < 1 \\ 1/4 & \text{for } 1 \leq t < 3 \\ 1/2 & \text{for } 3 \leq t < 5 \\ 3/4 & \text{for } 5 \leq t < 7 \\ 1 & \text{for } t \geq 7 \end{cases}$$

Find (i) $\mathbb{P}(T = 5)$ and Find (ii) $\mathbb{P}(1.4 < T < 6)$

¹gzheng90@ku.edu; Office hours: TuTh 11:00-11:50; Office = 641 Snow Hall

²chessa_m@ku.edu