

(Due Tuesday 04/09/2019 **right before** the class)

&

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

SPRING/2019/MA526: HOMEWORK 8

Instructor: Guangqu Zheng¹; Grader: Chessa Mccalla²

Total points: 20

Q1 (4 pt) Let X be a standard normal random variable, find the expected value of $|X|$, i.e. compute

$$\mathbb{E}[|X|].$$

And find the probability density function of the random variable $|X|$.

Q2 (4pt) Gauges are used to reject all components for which a certain dimension is not within the specification

$$1.50 \pm d.$$

It is known that this measurement is normally distributed with mean 1.5 and standard deviation 0.2. Determine the value of d such that these specifications “cover” 99.8%. [Use the normal table.]

Explain why the assumption that “**this measurement is normally distributed**” is not ridiculous at all? (We know that the normal random variable could take negative values.)

Q3 (4pt) One-sixth of the male freshmen entering a large state school are out-of-state students. If the students are assigned at random to dormitories, 180 to a building, what is the probability that in a given dormitory at least one-fifth of the students are out-of-state? [Use normal approximation.]

Q4 (2+2pt) Consider X a standard exponential random variable, that is, X has the following probability density function

$$f(x) = e^{-x} \quad x \geq 0 \quad \text{and} \quad f(x) = 0 \quad x < 0.$$

(1) Find the cumulative distribution function of X . Let us denote it by F .

(2) What is the distribution of $F(X)$? Explain with enough details to get your points here.

Q5 (4pt) A certain type of device has an advertised failure rate of 0.01 per hour. The failure rate is constant and the exponential distribution applies.

(1) What is the mean time to failure?

(2) What is the probability that 200 hours will pass before a failure is observed?

Explain your answers with enough details to get your points here.

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

²chessa_m@ku.edu