(Due Tuesday 03/19/2019 right before the class)
&
(Your homework shall be stapled if it contains multiple pages.)

SPRING/2019/MA526: HOMEWORK 5

Instructor: Guangqu Zheng[1]; Grader: Chessa Mccalla[2]

Total points: 20

Q1 $(2+2+2$ points) Find the exact value of k such that

$$f(x) = k\binom{3}{x}\frac{1}{5^x}(4/5)^{3-x}\,, \quad x = 0,1,2,3$$

defines a probability mass function. `An approximate value of k from your calculator can not be regarded as a right answer.`

Find the mean and variance of a random variable X if X has the above probability mass function.

Q2 $(2+2+2$ points) If the joint probability distribution of X and Y is given by

$$f(x,y) = Cx(1+2y^2) \quad \text{for } 0<x<2 \quad \& \quad 0<y<1;\, f(x,y)=0, \text{ elsewhere.}$$

(a) Find the exact value of C.

(b) Compute $\mathbb{E}\big[XY^2\big]$

(c) Find the variance of XY^2.

Q3 $(2+2$ points) Find the covariance of two random variables X,Y that have the following joint density function

$$f(x,y) = \begin{cases} x+y & x,y\in(0,1) \\ 0 & elsewhere. \end{cases}$$

Find the probability that $X+Y>1/2$.

Q4 $(2+2$ points)

The density function of the random variable X is

$$f(x) = \begin{cases} 6x(1-x), & 0<x<1 \\ 0, & \text{elsewhere.} \end{cases}$$

Let μ,σ denote its mean and standard deviation respectively.

(a) compute $\mathbb{P}\big(\mu-2\sigma<X<\mu+2\sigma\big)$.

(b) Compare the result (a) with the bound obtained from Chebyshev's theorem.

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