

Stat 331/Elec 331, Homework 2, September 19

Solutions should be clear, complete and easy to follow. You are allowed to use the book and lecture notes. Collaboration is allowed. The maximum score is given at the end of each problem.

Solutions are due on the date at the top. If you can not come to class and hand it to me there, you will have to come by my office (slide it under the door if I am not there). If you can not make it on time, you may still return your solutions but there will be a two point deduction for each day you are late.

1. Roll a die twice. Let X be the number of dots in the first roll and Y the number in the second. Consider the events $A = \{X \geq 4\}$, $B = \{Y \leq 4\}$ and $C = \{X + Y = 10\}$.

a. Compute $P(A)$, $P(B)$, $P(C)$ and $P(A \cap B \cap C)$.

b. Are A , B and C independent? (3)

2. Cards are drawn one by one at random from a deck of 52 cards. Let X be the number of trials needed to draw the ace of spades. Find the probability mass function of X if we draw

a. with replacement

b. without replacement. (3)

3. Which of the following functions are possible probability density functions for continuous random variables? For those that are, also find the distribution function.

a. $f(x) = |x|$, $-1 \leq x \leq 1$

b. $f(x) = \frac{3}{2}(x^2 - 1)$, $0 \leq x \leq 2$

c. $f(x) = 1, \quad -1 \leq x \leq 0$

d. $f(x) = 1/x^2, \quad x > 1.$ (4)

4. Let $X \sim \text{unif}(0, 1)$, let $Y = \sqrt{X}$ and let $Z = 1/X$. Find the pdf's of Y and Z and sketch their graphs. (4)

5. When I drive to Rice in the morning I turn left on Sunset from Greenbriar where there is a stoplight. About 80% of the time it is red, in which case my waiting time until it gets green is uniform on $(0, 30)$ seconds (and if it is green my waiting time is of course 0). Let X be my waiting time the next time I arrive at the stoplight. Find the cdf of X and sketch its graph. Is X discrete? Continuous? Why/why not? (3)