

CSCI 12022

Probability Distributions and Applications

Assignment 1

Due Date: 10th of December, 2020

01.

x	1	2	3	4
f(x) = P(X = x)	0.1	0.2	0.3	0.4

- Define the function of x (as a general function).
- What is the probability of getting x = 1.8?
- What is the probability of getting outcomes which is less than 1.8?

01. Given the probability distribution for a random variable X, the p.m.f. is given as follows.

x	1	2	4	6
f(x)	0.2	0.5	0.1	0.2

- Find $P(2 \leq X \leq 6)$
- Find $P(2 \leq X \leq 4.5)$
- Find $P(X \leq 4.5)$
- Find $P(X \geq 2.5)$

02. Given the probability distribution for a random variable X, the p.d.f. is given as follows.

$$f(x) = \begin{cases} c(1 + x^2); & -2 < x < 1 \\ 0; & \text{otherwise} \end{cases}$$

Here c is a constant.

- Find the value of c if the pdf is a valid function.
- Find the CDF of the function.

03. Given the probability distribution for a random variable X, the p.d.f. is given as follows.

$$f(x) = \begin{cases} \frac{3x^2}{8}; & 0 < x < 2 \\ 0; & \text{otherwise} \end{cases}$$

- Sketch the p.d.f. $f(x)$
- Find $F(1)$.
- Find $F(x)$

04. The CDF of a random variable X is given by,

$$F(x) = \begin{cases} 0; & x < 0 \\ \frac{1}{32}(6x^2 - x^3); & 0 \leq x \leq 4 \\ 1; & x > 4 \end{cases}$$

- a) Calculate $P(2 < X < 3)$
- b) Calculate $P(X \geq 1.8)$
- c) Calculate $P(X = 1)$

05. The probability density function for a random variable X is given by

$$f(x) = \begin{cases} \frac{x}{4} & ; 0 \leq x \leq 2 \\ \frac{(4-x)}{4} & ; 2 \leq x \leq 4 \\ 0; & otherwise \end{cases}$$

Find the CDF.

[When you find the CDF for questions 2,3 and 5, please state it according to the relevant intervals.

For an example

The length of time X , needed by students in a particular course to complete a 1 hour exam is a random variable with PDF given by

$$f(x) = \begin{cases} k(x^2 + x) & \text{if } 0 \leq x \leq 1, \\ 0 & \text{else} \end{cases}$$

For the random variable X ,

The CDF for this is as follows after finding the value for k ;

$$F(x) = \begin{cases} 0 & \text{if } x < 0, \\ \frac{6}{5} \left(\frac{x^3}{3} + \frac{x^2}{2} \right) & \text{if } 0 \leq x \leq 1, \\ 1 & \text{if } x > 1. \end{cases}$$

For further help, check this link <https://blogs.ubc.ca/math105/continuous-random-variables/example/>

