Mathematics for Data Science **2023/24**

Week-3 Continuous Variables Distribution

Answer the following questions

1. Let XX be a random variable with PDF given by

$$f_X(x) = \begin{cases} cx^2 & |x| \le 1 \\ 0 & \text{otherwise} \end{cases}$$

a. Find the constant c

b. Find EX and Var(X).

c. Find P(X≥1/2)

2. Let XX be a continuous random variable with PDF

$$f_X(x) = \begin{cases} 4x^3 & 0 < x \le 1 \\ 0 & \text{otherwise} \end{cases}$$

Find P(X≤2/3|X>1/3)

3. The continuous random variable X is uniformly distributed over the interval [–1, 3]. Find

(a) $\mathrm{E}(X)$

(b) $\mathrm{Var}(X)$

(*c*) $E(X^2)$

(*d*) $P(X < 1.4)$

A total of 40 observations of X are made.

(*e*) Find the probability that at least 10 of these observations are negative.

5. The continuous random variable X is uniformly distributed over the interval $[-2, 7]$.

(*a*) Write down fully the probability density function $f(x)$ of X.

(*b*) Sketch the probability density function $f(x)$ of X.

Find

(*c*) $E(X^2)$,

(*d*) $P(-0.2 < X < 0.6)$.