# AI1103-Assignment 2

Name : Umesh Kalvakuntla Roll No. : CS20BTECH11024

Download latex-tikz codes from

https://github.com/Umesh−k26/AI−1103/blob/main
/Assignment2/assignment2.tex

https://github.com/Umesh−k26/AI−1103/blob/main
/Assignment2/codes/assignment2.py

QUESTION

Let the probability density funciton of a random variable X be

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

then, the value of c is equal to ———.

SOLUTION

For a probability density function of a continuous random variable,

$$
\int_{-\infty}^{\infty} f(x)\,dx = 1 \tag{0.0.1}
$$

$$
\int_{-\infty}^{\infty} f(x)\,dx = \int_{0}^{1/2} f(x)\,dx + \int_{1/2}^{1} f(x)\,dx \tag{0.0.2}
$$

$$
= \int_{0}^{1/2} x\,dx + \int_{1/2}^{1} c(2x-1)^2\,dx \tag{0.0.3}
$$

$$
= \left.\frac{x^2}{2}\right|_{0}^{1/2} + c\left.\left(\frac{4x^3}{3} - 2x^2 + x\right)\right|_{1/2}^{1} \tag{0.0.4}
$$

$$
= \frac{1}{8} + c\left(\frac{1}{3} - \frac{1}{6}\right) \tag{0.0.5}
$$

$$
= \frac{1}{8} + \frac{c}{6} \tag{0.0.6}
$$

from (0.0.1) and (0.0.6) we get

$$
1 = \frac{1}{8} + \frac{c}{6} \tag{0.0.7}
$$

$$
\therefore c = \frac{21}{4} \tag{0.0.8}
$$

Graph of the function $f(x)$ using python: