Assignment 5

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Download all python codes from

https://github.com/Ananthoju-Pranav-Sai/AI1103/tree/main/Assignment_5/Codes

and latex codes from

https://github.com/Ananthoju-Pranav-Sai/AI1103/blob/main/Assignment_5/main.tex

GATE 2018 MA -Problem 24

Let the cumulative distribution function of the random variable X be given by

$$F_X(x) = \begin{cases} 0 & x < 0 \\ x & 0 \le x < 1/2 \\ (1+x)/2 & 1/2 \le x < 1 \\ 1 & x \ge 1 \end{cases}$$

Then $\Pr(X = 1/2) = ?$

Solution

Given,

$$F_X(x) = \begin{cases} 0 & x < 0 \\ x & 0 \le x < 1/2 \\ \frac{(1+x)}{2} & 1/2 \le x < 1 \\ 1 & x \ge 1 \end{cases} \tag{24.1}$$

$$\Pr(X = 1/2) = \Pr(X \le 1/2) - \Pr(X < 1/2) \tag{24.2}$$

$$\implies \Pr(X = 1/2) = F_X\left(\frac{1}{2}\right) - F_X\left(\frac{1^-}{2}\right) \tag{24.3}$$

Using (24.1) in (24.3),

$$\implies \Pr(X = 1/2) = \frac{(1 + 1/2)}{2} - (1/2) \tag{24.4}$$

$$\implies \Pr(X = 1/2) = (3/4) - (1/2) \tag{24.5}$$

$$\therefore \Pr(X = 1/2) = 1/4 \tag{24.5}$$

The cdf plot of random variable X is as shown in Fig. 0

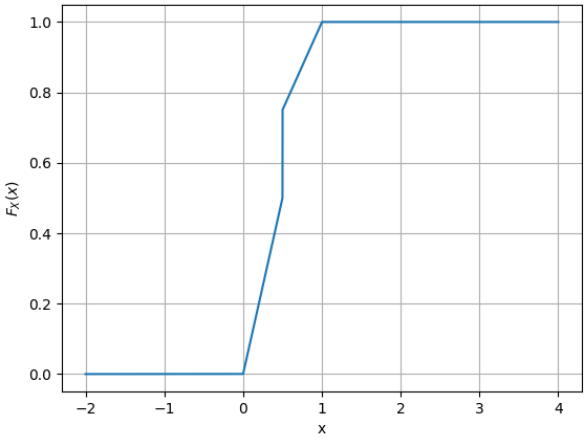

Fig. 0: cdf plot of random variable X