

AI1103-Assignment 3

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Download all python codes from

<https://github.com/asishcs2011010/demo/blob/main/assignment-4/assignment-4.py>

and latex-tikz codes from

<https://github.com/asishcs2011010/demo/blob/main/assignment-4/assignment-4.tex>

QUESTION NO

gov/stats/2015/statistics-I(1), Q.1(C)

QUESTION

1)(c) Let X have pdf

$$f(x) = \begin{cases} \frac{1}{3} & -1 \leq x < 2 \\ 0 & \text{otherwise} \end{cases}$$

SOLUTION

CDF of X is defined as,

$$F_X(x) = \Pr(X \leq x) \quad (0.0.1)$$

The cdf of $Y = X^2$ is given by $G(y)$

$$G(y) = F_X(y) = \Pr(X^2 \leq y) = \Pr(X \leq \sqrt{y}) = F_X(\sqrt{y}) \quad (0.0.2)$$

$$G(y) = \int_{\max(-1, -\sqrt{y})}^{\min(2, \sqrt{y})} \frac{1}{3} dx \quad (0.0.3)$$

As bounds of integral should also remain within the support of the random variable X.

so when $0 \leq y < 1$, we have

$\max(-1, -\sqrt{y}) = -\sqrt{y}$, and when $1 \leq y$ it is -1. similarly the upper limit is \sqrt{y} when $y < 9$ and 3 otherwise

$$G(y) = \begin{cases} 0 & y < 0 \\ \frac{2\sqrt{y}}{3} & 0 \leq y < 1 \\ \frac{\sqrt{y}+1}{3} & 1 \leq y < 4 \\ 1 & y \geq 4 \end{cases}$$

The plot of CDF is given in the Figure 0

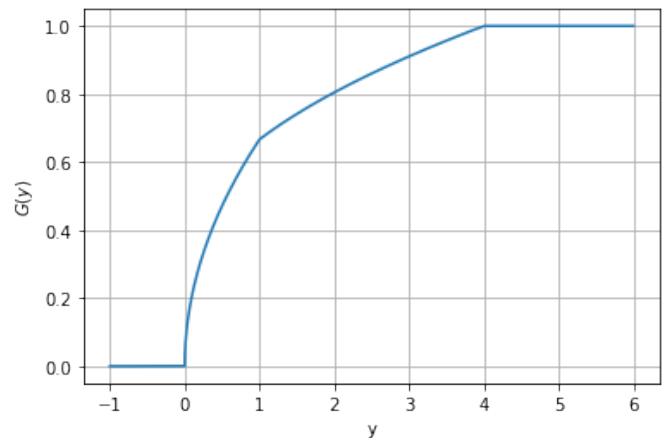


Fig. 0: CDF of X