AI1103-Assignment 2

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Python codes :
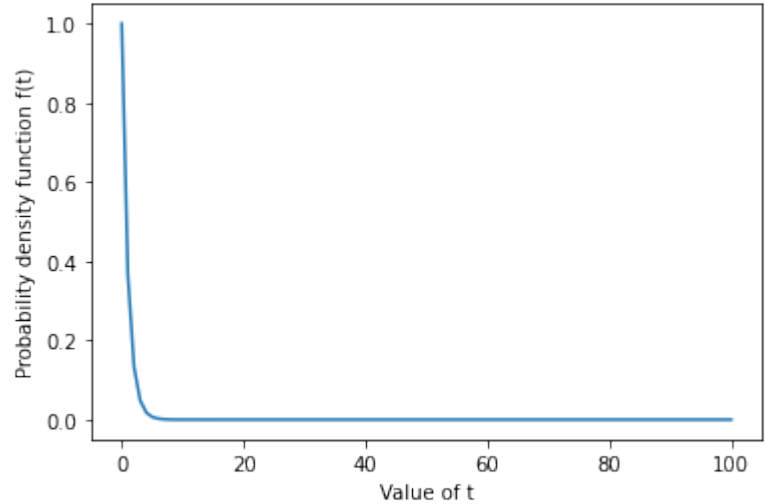
https://github.com/Aayush−2492/Assignment−2/
tree/main/code

Latex codes :

https://github.com/Aayush−2492/Assignment−2

QUESTION 29

A discrete random variable X takes values from 1 to 5 with probabilities as shown in the table. A student calculates the mean of X as 3.5 and her teacher calculates the variance of X as 1.5. Which of the following statements is true? Let X be a random variable with probability density function:

$$f(t) = \begin{cases} e^{-t} & t \geq 0 \\ 0 & t < 0 \end{cases}$$

Let $b > a > 0$. Then the probability $P(X \leq b | X \geq a)$

  A) b-a
  B) a
  C) b
  D) a+b

SOLUTION

$$P(X \leq b | X \geq a) = \frac{P((X \leq b) \cdot (X \geq a))}{P(X \geq a)} \quad (0.0.1)$$

$$= \frac{P(a \leq X \leq b)}{P(X \geq a)} \quad (0.0.2)$$

$$= \frac{\int_a^b e^{-t}\,dt}{\int_a^\infty e^{-t}\,dt} \quad (0.0.3)$$

$$= \frac{-e^{-t}\Big|_a^b}{-e^{-t}\Big|_a^\infty} \quad (0.0.4)$$

$$= \frac{e^{-a} - e^{-b}}{e^{-a}} \quad (0.0.5)$$

$$= 1 - e^{-(b-a)} \quad (0.0.6)$$

Therefore the required probability depends on $b - a$
Option (A) is correct.

Plot for probability density function.