AI1103-Assignment 4

Name : Aayush Patel, Roll No.: CS20BTECH11001

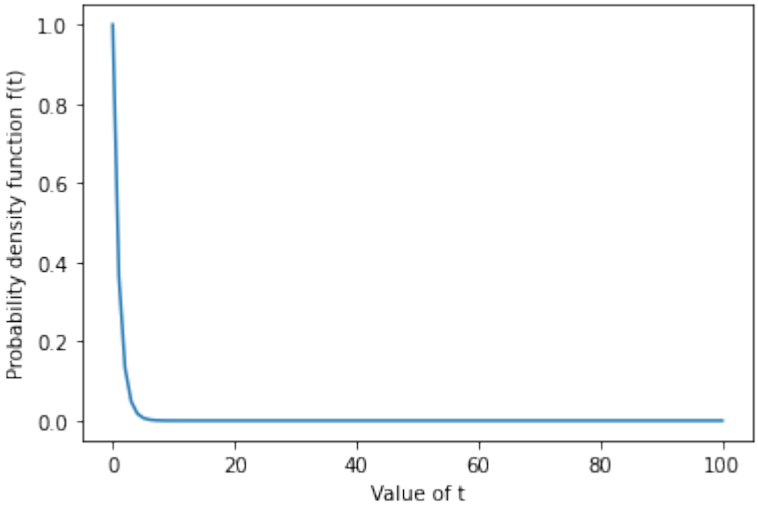
Python codes :

https://github.com/Aayush−2492/Assignments/tree/main/Assignment4/code

Latex codes :

https://github.com/Aayush−2492/Assignments/tree/main/Assignment4

Plot for probability density function.



Question 29

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

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

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

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

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

$$= \frac{e^{-a} - e^{-b}}{e^{-a}} \tag{0.0.5}$$

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

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