

# AI5002: Assignment 12

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Download all Python codes from

[https://github.com/Debolena/AI5002-Probability-and-Random-Variables/blob/main/Assignment\\_12/exponential.py](https://github.com/Debolena/AI5002-Probability-and-Random-Variables/blob/main/Assignment_12/exponential.py)

and latex-tikz codes from

[https://github.com/Debolena/AI5002-Probability-and-Random-Variables/blob/main/Assignment\\_12/latex.tex](https://github.com/Debolena/AI5002-Probability-and-Random-Variables/blob/main/Assignment_12/latex.tex)

## 1 PROBLEM

A continuous random variable  $X$  has a probability density function  $f(x) = e^{-x}, 0 < x < \infty$ . Then  $P(X > 1)$  is

- 1) 0.368
- 2) 0.5
- 3) 0.632
- 4) 1.0

## 2 SOLUTION

$$F_X(x) = P(X \leq x) \quad (2.0.1)$$

$$= \int_0^x e^{-t} dt \quad (2.0.2)$$

$$= 1 - e^{-x} \quad (2.0.3)$$

Thus, the CDF of  $X$  is:

$$F_X(x) = P(X \leq x) \quad (2.0.4)$$

$$= \begin{cases} 0, & \text{if } x \leq 0 \\ 1 - e^{-x}, & \text{if } 0 < x < 1 \\ 1 & \text{if } x \geq 1 \end{cases} \quad (2.0.5)$$

$$P(X > 1) = 1 - P(X \leq 1) \quad (2.0.6)$$

$$= 1 - \{1 - e^{-1}\} \quad (2.0.7)$$

$$= e^{-1} \quad (2.0.8)$$

$$= 0.3678 \quad (2.0.9)$$

$$= 0.368 \quad (2.0.10)$$

Hence, option(1) is the correct answer.

The below figure shows the plot of the simulated exponential distribution with mean 1.

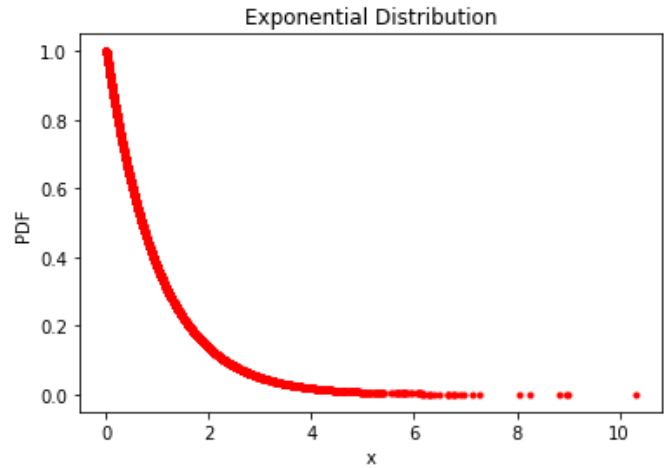


Fig. 4: Exponential Distribution Plot