

# AI1103

## Assignment 5

Nagubandi Krishna Sai  
MS20BTECH11014

Download Python codes from below link :

<https://github.com/KRISHNASAI1105/demo/blob/main/Assignment%205/code/Assignment%205.py>

Download LaTeX file from below link :

<https://github.com/KRISHNASAI1105/demo/blob/main/Assignment%205/LaTex/Assignment%205.tex>

### Problem number GATE EC 2019 Q.20

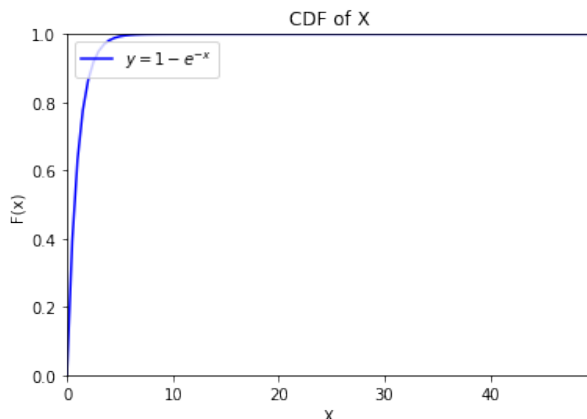
Let  $Z$  be an exponential random variable with mean 1. That is, the cumulative distribution function of  $Z$  is given by

$$F_Z(x) = \begin{cases} 1 - e^{-x}, & \text{if } x \geq 0 \\ 0, & \text{if } x < 0. \end{cases} \quad (0.0.1)$$

Then  $\Pr(Z > 2 \mid Z > 1)$ , rounded off to two decimal places, is equal to

### Solution

Given that  $Z$  is an exponential distribution with cumulative function  $F_Z(x)$ .



We know that probability density function

$$f_Z(x) = F'_Z(x) = \begin{cases} e^{-x}, & x \geq 0 \\ 0, & x < 0 \end{cases} \quad (0.0.2)$$

The CDF of  $X$  is,

$$\begin{aligned} F_Z(x) &= \Pr(Z \leq x), \text{ for all } x \in R \\ \Pr(Z \leq 2) &= F_Z(2) \\ &= 1 - e^{-2} \\ \Pr(Z \leq 1) &= F_Z(1) \\ &= 1 - e^{-1} \end{aligned}$$

$$\Pr(Z > 2 \mid Z > 1) = \frac{\Pr((Z > 2), (Z > 1))}{\Pr(Z > 1)} \quad (0.0.3)$$

$$= \frac{\Pr(Z > 2)}{\Pr(Z > 1)} \quad (0.0.4)$$

$$= \frac{1 - \Pr(Z \leq 2)}{1 - \Pr(Z \leq 1)} \quad (0.0.5)$$

$$= \frac{e^{-2}}{e^{-1}} \quad (0.0.6)$$

$$= e^{-1} = 0.3679 \quad (0.0.7)$$

