

AI 1103 - Assignment 5

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Download all python codes from

https://github.com/rohanthota/Assignment_5/codes/Assignment_5.py

and latex codes from

https://github.com/rohanthota/Assignment_5/Assignment_5.tex

Question

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

Solution

x is uniform, with $0 < x < \infty$.

$f(x) = e^{-x}$ is uniform, with $0 < f(x) < 1$.

Let, $F_X(x)$ be the cumulative distribution function of X . As, $0 < x < \infty$, $F_X(x) = 0$ for $x < 0$

$$\begin{aligned} F_X(x) &= \Pr(X \leq x) = \int_0^x f(x) dx = \int_0^x e^{-x} dx \\ &= [-e^{-x}]_0^x = (-e^{-x}) - (-e^0) = 1 - e^{-x} \end{aligned} \quad \begin{matrix} (0.0.1) \\ (0.0.2) \end{matrix}$$

$$\Pr(X > 1) = 1 - F_X(1) \quad (0.0.3)$$

$$= 1 - (1 - e^{-1}) = 0.368 \quad (0.0.4)$$

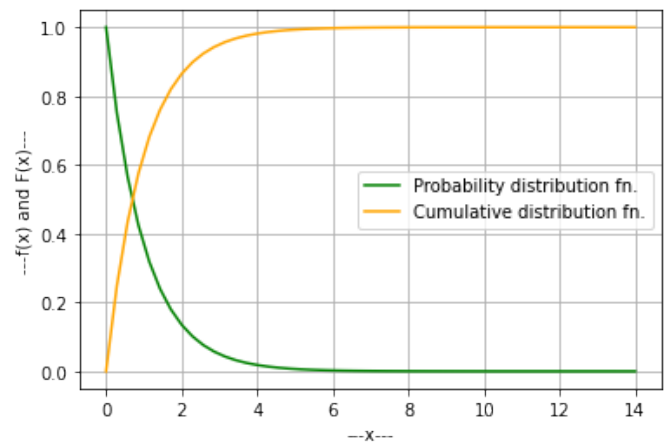


Fig. 0: Plotting probability distribution and cumulative distribution functions.