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, $F(x)$ be the cumulative distribution function of X.

$$F(x) = \Pr(X \leq x) = \int_0^x f(x)\,dx = \int_0^x e^{-x}dx \tag{0.0.1}$$

$$= [-e^{-x}]_0^x = (-e^{-x}) - \left(-e^{0}\right) \tag{0.0.2}$$

$$F(x) = 1 - e^{-x} \tag{0.0.3}$$

$$\text{Now, } \Pr(X > 1) = 1 - \Pr(X \leq 1) \tag{0.0.4}$$

$$\Pr(X \leq 1) = 1 - e^{-1} \tag{0.0.5}$$

$$\Pr(X > 1) = e^{-1} \tag{0.0.6}$$

$$\Pr(X > 1) = 0.368 \tag{0.0.7}$$

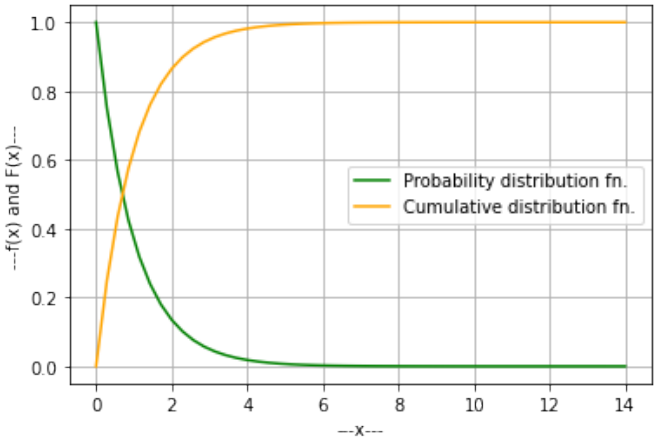

Fig. 0: Plotting probability distribution and cumulative distribution functions.