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

Here, x is a uniform variable with $0 < x < \infty$. which tells us $f(x) = e^{-x}$ is also uniform, with $0 < f(x) < 1$.

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

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

$$\tag{0.0.1}$$

$$= \left[-e^{-x}\right]_0^x = \left(-e^{-x}\right) - \left(-e^0\right) = 1 - e^{-x} \tag{0.0.2}$$

$$\text{Now, } \Pr(X > 1) = 1 - \Pr(X \le 1) \tag{0.0.3}$$

$$\Pr(X \le 1) = 1 - e^{-1} \tag{0.0.4}$$

$$\Pr(X > 1) = e^{-1} = 0.368 \tag{0.0.5}$$

Plotting probability distribution and cumulative distribution functions.