Assignment 2

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latex-tikz codes from

https://github.com/diya−goyal−29/AI1103/blob/main/Assignment%202/Assignment%202.tex

1 Gate problem no. 42

Let X be a zero mean unit variance Gaussian random variable. $E[|X|]$ is equal to ...

2 Solution

Mean = $\mu = 0$
Variance = $\sigma = 1$
Gaussian Probability Distribution Function

$$= f(x) \tag{2.0.1}$$

$$= \frac{1}{\sqrt{2\pi\sigma}} \exp\left(\frac{-(x-\mu)^2}{2\sigma^2}\right) \tag{2.0.2}$$

$$= \frac{1}{\sqrt{2\pi}} \exp\left(\frac{-x^2}{2}\right) \tag{2.0.3}$$

$$E[|X|] = \int_{-\infty}^{\infty} |x| f(x) \tag{2.0.4}$$

$$= 2\int_{0}^{\infty} x f(x) dx \tag{2.0.5}$$

$$= 2\int_{0}^{\infty} x \frac{1}{\sqrt{2\pi}} \exp\left(\frac{-x^2}{2}\right) dx \tag{2.0.6}$$

$$= \sqrt{\frac{2}{\pi}} \int_{0}^{\infty} x \exp\left(\frac{-x^2}{2}\right) dx \tag{2.0.7}$$

$$= \sqrt{\frac{2}{\pi}} \int_{0}^{\infty} (-1) \exp(u) du \tag{2.0.8}$$

(Using substitution)

$$= \sqrt{\frac{2}{\pi}} \tag{2.0.9}$$

$$= 0.7978 \tag{2.0.10}$$