

Assignment 2

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latex-tikz codes from

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

Gate problem no. 42

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

Solution

Mean = $\mu = 0$

Variance = $\sigma = 1$

Gaussian Probability Distribution function

$$\begin{aligned} &= p(x) \\ &= \frac{1}{\sqrt{2\pi}\sigma} \exp\left(\frac{-(x-\mu)^2}{2\sigma^2}\right) \\ &= \frac{1}{\sqrt{2\pi}} \exp\left(\frac{-x^2}{2}\right) \end{aligned}$$

$$\begin{aligned} E[|X|] &= \int_{-\infty}^{\infty} |x| p(x) \\ &= \int_{-\infty}^{\infty} |x| \frac{1}{\sqrt{2\pi}} \exp\left(\frac{-x^2}{2}\right) dx \\ &= 2 \times \frac{1}{\sqrt{2\pi}} \int_0^{\infty} x \exp\left(\frac{-x^2}{2}\right) dx \\ &= \sqrt{\frac{2}{\pi}} \int_0^{\infty} \exp(-u) du \end{aligned}$$

(Using substitution method)

$$\begin{aligned} &= \sqrt{\frac{2}{\pi}} \times (-1) \times (0 - 1) \\ &= \sqrt{\frac{2}{\pi}} \\ &= 0.799 \end{aligned}$$