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
$= p(x)$
$= \frac{1}{\sqrt{2\pi}\sigma} exp(\frac{-(x-\mu)^2}{2\sigma^2})$
$= \frac{1}{\sqrt{2\pi}} exp(\frac{-x^2}{2})$

$$\phi(t) = \int_{-\infty}^{\infty} p(x) \exp(tx) dx \qquad (0.0.1)$$

$$\phi'(t) = \int_{-\infty}^{\infty} p(x)x \exp(tx) dx \qquad (0.0.2)$$

$$E[X] = \phi'(0) \qquad (0.0.3)$$

$$= \int_{-\infty}^{\infty} |x| p(x) \qquad (0.0.4)$$

$$= 2 \cdot \int_{0}^{\infty} xp(x) dx \qquad (0.0.5)$$

$$= 2 \cdot \int_{0}^{\infty} x \frac{1}{\sqrt{2\pi}} \exp(\frac{-x^2}{2}) dx \qquad (0.0.6)$$

$$= \sqrt{\frac{2}{\pi}} \cdot \int_{0}^{\infty} x \exp(\frac{-x^2}{2}) dx \qquad (0.0.7)$$

$$= \sqrt{\frac{2}{\pi}} \qquad (0.0.8)$$

$$= 0.7978 \qquad (0.0.9)$$