

Problem 1

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1 Introduction

- The Gaussian integral is also known as the **Euler–Poisson integral**. It is the integral of the Gaussian function

$$e^{-x^2} \tag{1}$$

over the entire real line. It is named after the German mathematician Carl Friedrich Gauss.

- The integral can be represented as :

$$\int_{-\infty}^{\infty} e^{-x^2} dx = \sqrt{\pi} \tag{2}$$

2 Uses

- Mainly used in the field of advanced Mathematics and physics (eg. quantum field theory)
- They are used to find indefinite integrals of any function in Mathematics.
- Required for evaluating the constant for the Normal Distribution.

3 Characteristics

- The graph for the function whose indefinite integral is to be calculated is a normal distribution curve.
- Aims at finding the volume under the curve of the function
- The Gaussian Integral can be computed using 2 well known methods:
 - i) By Polar Coordinates
 - ii) By Cartesian Coordinates
- The integrand is always an even function.