Homework Assignment 9: Gaussian integration in $\mathbb{R}^n$

Assigned Thursday November 13; due Thursday November 20 in class.

Important. No class next Tuesday (November 18th)! Thursday's class will meet as usual.

To be handed in.

1. For any even natural number m compute the integral

$$\int_{-\infty}^{\infty} dx \, x^m e^{-x^2/2}.$$

2. For any odd natural number m compute the integral

$$\int_{0}^{\infty} dx \, x^m e^{-x^2/2}.$$

3. For any natural number n use Gaussian integration in $\mathbb{R}^n$ to compute the volume (area) of the $(n-1)$-dimensional sphere $S^{n-1} = \{x \in \mathbb{R}^n : |x| = 1\}$ and the volume of the n-dimensional ball $B^n = \{x \in \mathbb{R}^n : |x| \leq 1\}$.