PROBLEM SET 1

Reading: Chapter 1 (especially sections 1.1-1.6 and last paragraph of page 39) and Chapter 2 in Reif.

Problems:

Hint: Notice that for analytical calculations, there are many helpful mathematical appendices in Reif.

1. Show explicitly (by hand, not mathematica) that the following identities are correct for the Gaussian function

\[ P(x)dx = \frac{1}{\sqrt{2\pi}\sigma}e^{-\frac{(x-\mu)^2}{2\sigma^2}}dx \]

(a) Normalization

\[ \int_{-\infty}^{\infty} dx P(x) = 1 \]

(b) Mean or average value

\[ \mu = \int_{-\infty}^{\infty} dx x P(x) \]

(c) Variance or second moment of the distribution

\[ \sigma^2 = \langle x - \mu \rangle^2 \]

2. Reif 1.9

3. Reif 1.10

4. Reif 1.11

5. Reif 1.19

6. Reif 2.1