PROBLEM SET 1

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

**Hint:** Notice that there are *many* helpful mathematical appendices in Reif.

1. Show explicitly 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**

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

(c) **Variance or second moment of the distribution**

\[
\sigma^2 = (x - \mu)^2
\]

2. Reif 1.9

3. Reif 1.10

4. Reif 1.11

5. Reif 2.1