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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

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

- (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

$$\sigma^2 = \overline{(x - \mu)^2}$$

2. Reif 1.9
3. Reif 1.10
4. Reif 1.11
5. Reif 1.19
6. Reif 2.1