## Homework 1

Ch En 593R – Statistical Thermodynamics

Due: 20 Sep. 2024

## Instructions

Complete the problems below and submit the following files to Learning Suite:

- Handwritten portion: scan each page (or take a picture) and combine them into a single pdf named LastName\_FirstName\_HW1.pdf
- Numerical portion: submit a file named LastName\_FirstName\_HW1.py or \*.ipynb or whatever you used.

## Problems

- 1. Starting from Eq. 2.60 in Kaznessis (on p. 25) derive Eq. 2.67.
- 2. Do Kaznessis Chapter 2, Problem 1
- 3. Do Kaznessis Chapter 2, Problem 5
- 4. Do Kaznessis Chapter 2, Problem 6
- 5. Do Kaznessis Chapter 2, Problem 10
- 6. Do Kaznessis Chapter 2, Problem 17
- 7. Compute the cumulant generating function of the Maxwell–Boltzmann distribution (pdf given below) and use it to compute the mean and variance.

$$f(x) = \sqrt{\frac{2}{\pi}} \frac{x^2}{a^3} \exp\left(\frac{-x^2}{2a^2}\right)$$

Note: The MB pdf is usually written in your chemistry textbook with  $a = (k_B T/m)^{1/2}$  and  $x = |v| = (v_x^2 + v_y^2 + v_z^2)^{1/2}$