Computation of the Error Function through integral using Trapezoidal int.

Exercise 5.3

Things I Know:

Trapezoidal rule

$$I(a,b) = \int_a^b f(x)\,dx \qquad A_k = \tfrac{1}{2} h \left[f(a + (k-1)h) + f(a + kh) \right]$$

$$h = \frac{(b-a)}{N} \qquad E(x) = \int_0^x e^{-t^2}\,dt$$

Define the function to integrate

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Define the trapezoidal integration

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Set up all the constants used

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Evaluate the sum for the integral I(a,b) term by term in this case $x = 0$ to $x = 3$ in steps of 0.1 by creating a for loop.

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Plot the graph

Heat capacity of a solid

Exercise 5.9

V = volume

ρ = # of density of atoms

Θ_D = Debye temp.

Know $$C_V = 9 V \rho k_B \left(\frac{T}{\Theta_D}\right)^3 \int_0^{\Theta_D/T} \frac{x^4 e^x}{(e^x - 1)^2}\, dx$$

k_B = Boltzmann's const. = 1.380649×10^{-23} J/K

Start by defining the function to integrate (in this case the integral in the right end of the equation

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Define the function to calculate C_V

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Define the constants given in the problem

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Define the integration limits

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Evaluate integral using trapezoidal rule so define h, s, & create a loop that will evaluate the integral term by term

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Calculate C_V by using multiplying the constants time the obtained integral

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Create a list of the temperature from 5 to 500 K

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Plot the graph