Physics 112 - Intro to Statistical and Thermal Physics - Spring 2023
Spoiler Set 05

Problem 6.1 - Return of the Paramagnet

(a) It's not just half of them! Think about the combinatorics. If we know we have $N_\uparrow$ total up-spins and we know the first spin is one of the up-spins, what does that leave us?

(d) Recall that given a probability distribution $P(X)$ for an observable X, we have $\langle X\rangle = \sum_X XP(X)$.

Problem 6.2 - Exploring the Microcanonical Ideal Gas

(b) Remember the thermodynamic identity for the entropy dS in terms of dU, dV, and dN.

(g) As an intermediate step you should find

$$P_A(x) = e^{\sigma(x)-\sigma(f)}.$$

You will be able to cancel a lot of things out and at the end of the day your formula should only depend on the paramaters x, f, and N. That is, the vs should disappear!

(i) The answer is absurdly small.

Problem 6.3 - Introducing Z into the Canon

(e) Remember your geometric series! $\displaystyle\sum_{k=0}^{\infty} r^k = 1/(1-r)$.

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