Physics 112 - Intro to Statistical and Thermal Physics - Spring 2023
Spoiler Set 12

Problem 12.1 - Bose-Einstein Condensation

(c) I found $T \approx 1.58 k_B T_C$.

(d) Your computed answer should be a bit higher than the known value, but within a factor of 2 of it.

(e) **Extra Part** (*Not for Credit*) $\langle U \rangle = 2\pi V \left(\frac{2m}{h^2}\right)^{3/2} \int_0^\infty \frac{E^{3/2}}{e^{\beta(E-\mu)}-1} dE$.

(f) Recall that $\mu \approx 0$ when $T < T_C$.

Problem 12.2 - Water and Water Vapor

(a) What I mean by "physically important": There will be an intersection point for the curves between solid-and-liquid and liquid-and-gas which represent the phase transitions (we jump from one curve to another when minimizing G). The intersection point for the solid-and-gas curve is not physically meaningful at this pressure since the liquid curve is the important one, having the smallest G in this region.

Problem 12.3 - Critical Exponents

(e) You should find that, in the dimensionless variables, $\frac{\partial p}{\partial t} = 4$.

(f) In the dimensionless variables, $\Delta v = 4\sqrt{1-t}$.

Easter Egg!

If you go to "Pages" on our bCourses site and find the "Grand Ensemble" you will find some fun things. =)

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