Physics 112 - Intro to Statistical and Thermal Physics - Spring 2023
Spoiler Set 10

Problem 10.1 - Photon Gases

(a) Recall that we've used the geometric series a number of times this semester: in the partition function for the Einstein solid/harmonic oscillator; in deriving the Bose-Einstein distribution function; even just last homework when deriving the Planck distribution function.

(c) There's a reason I started this problem with a discussion of a certain type of integral...

(e) $C_V = 16\sigma V T^3/c$.

Problem 10.2 - The Sun and the Earth

(a) **Extra Part** (*Not for Credit*) This should just be a simple exercise in geometry!
$R_\odot \approx 7 \times 10^8\,\text{m}$.

(b) We will get better numbers later but you can approximate the photons coming from the sun as mostly coming from the middle of the visible spectrum, $\sim 500\,\text{nm}$.

(d) The earth maintaining a constant temperature means that the net flow of energy absorbed the earth equals the net flow of energy emitted by the earth. While you will need the radius $R_\oplus$ of the earth for individual parts of the problem, it should wind up disappearing from the final answer.

Problem 10.3 - DataHub - Color and Temperature

(b) $\omega_{\text{peak}} \approx 2.821 k_B T/\hbar$.

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