A260

HW #3

10 Oct 2014

a) $$I(\omega) = \frac{\hbar}{4\pi^2 c^2} \frac{\omega^3}{e^{\hbar\omega/kT} - 1}$$

$$W(T) = \int_0^\infty I(\omega)\, d\omega = \frac{\hbar}{4\pi^2 c^2} \int_0^\infty \frac{\omega^3}{e^{\hbar\omega/kT} - 1}\, d\omega$$

$$\frac{\hbar\omega}{kT} = x \rightarrow d\omega = \frac{kT}{\hbar}\, dx$$

$$W(T) = \frac{\hbar}{4\pi^2 c^2} \left(\frac{kT}{\hbar}\right)^4 \int_0^\infty \frac{x^3\, dx}{e^x - 1}$$

$$W(T) = \frac{(kT)^4}{4\pi^2 c^2 \hbar^3} \int_0^\infty \frac{x^3\, dx}{e^x - 1}$$

b) when $x = 0$ $\quad \frac{x^3}{e^x - 1} \rightarrow 0$