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

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

putting $\frac{\hbar\omega}{k_B T} = x$,

differentiating, $\frac{\hbar}{k_B T} d\omega = dx$.

replacing ω and $d\omega$ in integrand, we get

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

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

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