1. Read Kardar chapter 6. Did you read all the pages?

2. (a) What is the energy density of the photons in an oven at 350°F?
   (b) What is the energy density of the air in an oven at 350°F?

3. (a) For the black body spectrum, find $\frac{h\nu_{\text{peak}}}{k_B T}$.
   (b) Derive a formula for the black body spectrum in terms of wavelength λ.
   (c) Find $\frac{hc}{\lambda_{\text{peak}} k_B T}$.
   (d) Explain why $\nu_{\text{peak}} \neq \frac{c}{\lambda_{\text{peak}}}$.

4. At the surface of the sun, what fraction of the radiated energy is in the visible part of the spectrum?

5. How many photons (on average) are in one cubic meter at
   (a) cosmic background temperature
   (b) room temperature
   (c) solar surface temperature
   (d) solar core temperature
   (e) What is the entropy per photon in natural units (leave k_B in the formula as a symbol)? Does it depend on temperature?

Bonus

1. We saw that the energy density of photons in a box at temperature T is $u = aT^4$, where a is the radiation constant. Show that the intensity of radiation escaping from a small hole in the box is $(\frac{c}{4})aT^4 = \sigma T^4$, where σ is the Stefan-Boltzmann constant.