Practice Problems Related to Blackbodies

Two stars that have the same radius, and are the same distance from us, have different temperatures T_1 and T_2. We suppose that they both emit isotropically, and their spectra are perfect blackbodies.

1. Give a simple expression for the ratio of the specific intensities that we see between the two stars at a frequency ν such that $h\nu \ll kT_1$ and $h\nu \ll kT_2$.

2. Same as problem 1, except that $h\nu \gg kT_1$ and $h\nu \gg kT_2$.

Now we suppose that we look at a single star, which again emits isotropically as a perfect blackbody. We fit the spectrum and discover that the blackbody temperature T, and that bolometric flux is F. We measure (by parallax, say) the distance to the star to be d.

3. Calculate the radius of the star.