ASTRO 735 - Problems

Set 2

Due: Mon, Oct. 2

Exercises

(a) Work out the formula for $K(z)$ for $L_\nu \propto \nu^{-\alpha}$. (Recall from class notes that $K(z) \equiv -2.5 \log k(z)$, where $k(z)$ is the first ratio of flux intergrals in the expression for $s_{\Delta\lambda_0}$.)

For what α is $K(z) = 0$?

Give an astrophysical example.

(b) Give expressions for I_{bol}, I_ν, I_λ, and I_γ, where I is the surface-intensity in units of flux per unit area, and flux has the appropriate units for bolometric, ν, λ and γ (photon flux) cases – as defined in class.

Note dependence on D and powers of $(1+z)$

(c) Write down the expression for

$$\frac{I_{\Delta\lambda}(z)}{I_{\Delta\lambda}(z=0)}$$

Find the expression for this surface-brightness ratio in magnitude units, where $\mu = -2.5 \log(I) + \mathit{constant}$, assuming $L_\nu \propto \nu^{-\alpha}$.

For what α is the ratio unity? Give an astrophysical example.