Physics 595CL – Homework 5

1) Andrews 7.1

2) Consider equation 7.3 in terms of the spectral transmittance.

$$L_i = B_i(T_g)\mathcal{T}_i + B_i(T_0)(1 - \mathcal{T}_i)$$

where ν has been replaced by the discrete index i.

Consider the case in which two observations at two different frequencies are made. Follow the steps presented in class for the split window technique and derive an expression for the ground temperature as:

$$B_1(T_g) = B_1(T_{b1}) + \eta(B_1(T_{b1}) - B_1(T_{b2}))$$

$$\eta = \frac{(1 - \mathcal{T}_1)}{(\mathcal{T}_1 - \mathcal{T}_2)}$$

where T_{b1} and T_{b2} are the brightness temperatures corresponding to the measured radiances L_1 and L_2 respectively.

3) Andrews 7.4

The radiance observation is made at a brightness temperature of $280K$ and at $9.6\mu m$. The ground brightness temperature corresponds to $310K$ and that for the stratosphere is $220k$.

4) Andrews 7.6

Please solve only for cases 1 and 2.

5) Andrews 7.7

The problem is referring to Andrews 7.6. You only need to do one sketch.