

Homework 1

1. Derive the barometric formula for an extended atmosphere with $\Delta r/R$ not small. Start from the general hydrostatic equation $dP/dr = -\rho(r)g(r)$, $g(r) = GM/r^2$. Assume $(1/\rho)(d\rho/dr) \gg (1/T)(dT/dr)$. Discuss the solution for $\Delta r/R \ll 1$ and demonstrate how it approaches the plane-parallel solution in this limit.
(4 points)
2. Consider an atmosphere with a pressure scale height H of the order of the stellar radius R , i.e. $H/R \sim 1$. Find a simple physical argument, why such an atmosphere can't be in hydrostatic equilibrium.
(3 points)
3. Why are the wavelengths λ_{max} in Wien's displacement law different for B_ν and B_λ ?
(3 points)
4. Verify the Wien- and the Rayleigh-Jeans limits for B_ν and B_λ .
(3 points)

Please return homework at Thursday, September 8