Astronomy 401

Stars

Homework # 6, Due Thursday, November 8, 2001

Name: ______________________________

Student number: ______________________

1. Estimate the magnitude of the superadiabatic gradient near the top and bottom of the solar convection zone. Use the mixing length theory expression we derived for the convective flux in terms of the superadiabatic gradient. Compare this with both the temperature gradient that would be required at those two locations to transport all the flux by radiation and the adiabatic temperature gradient.

	Top	Bottom
Luminosity	3.826×10^{33} erg/s	3.826×10^{33} erg/s
Radius	696 Mm	487 Mm
Gravity, g	2.74×10^{4} cm/s^2	5.59×10^{4} cm/s^2
Temperature	1×10^{4} K	1.2×10^{6} K
Density	3.36×10^{-7}g/cm^3	0.08 g/cm^3
μ	1.26	0.62
γ	1.2	5./3.
Opacity	$1. \times 10^{-29} \rho^{1/2} T^{8.5}$ cm^2/g	4.34×10^{25} Z(1+X) $\rho T^{-3.5}$ cm^2/g

   Assume the mixing length is equal to the pressure scale height. Reread the class notes and consult Carroll & Ostlie section 10.4.

2. Carroll & Ostlie: problem 10.9

3. Carroll & Ostlie: problem 10.12 (a) and (b)

4. Carroll & Ostlie: problem 10.15

5. Carroll & Ostlie: problem 10.16

6. Convection Project
   Perform the first of the Convection projects – 1. Trial run

7. If you have not yet done so, complete the experimentarium project, for half credit rather than zero credit.