Astronomy 401

Stars

Homework # 8, Due Thursday, November 29, 2001

Name: ______________________

Student number: ________________

SHOW ALL YOUR WORK!

1. Carroll & Ostlie: problem 12.2
2. Carroll & Ostlie: problem 12.7
3. *Scientific American*, December 2001, page 64, has an article on the formation of the first stars in the early universe. Explain **in your own words**, the main reason why these first stars were much more massive than the typical stars formed today. Be quantitative to the extent that you can. (A copy of the article is in the class notes in the library.)
4. Consider a star that starts life as a 10 $M_\odot$ diffuse, cold interstellar cloud of hydrogen (90%) and helium (10%) (abundance by number of atoms) plus a very small number of heavier nuclei. It ends life as a 2 $M_\odot$ neutron star, after having blown off 8 $M_\odot$ of its material in a supernova explosion. During its life it radiated energy at a rate $L \approx 5 \times 10^3$ $L_\odot$ for about 2.6×10^7 years.

   (a) Calculate its total (including rest mass) initial and final energy.

   (b) Calculate the total energy lost during its life.

   (c) What are the sources of this energy? (Give QUANTITATIVE answers.)
5. Convection Project
   Perform the third of the Convection projects – 3. Entropy Fluctuations.
6. If you have not yet done so, complete the second of the Convection projects – 2. Average Structure, for half credit rather than zero credit.