ASTR-3415-001: Astrophysics
Problem Set 3 (Due: 25 March 2003)

1. (10 pts) Problem 10.1, Page 375 in the Carroll and Ostlie textbook. Note that Carroll and Ostlie's $\overline{\kappa}$ is the mean mass absorption coefficient (cm^2/gm), which I gave as k in the notes, and not opacity (cm^{-1}) as the authors call it.

2. (20 pts) Problem 10.2, Page 375 in the Carroll and Ostlie textbook.

3. (20 pts) Problem 10.3, Page 375 in the Carroll and Ostlie textbook.

4. (20 pts) Problem 10.11, Page 376 in the Carroll and Ostlie textbook. Calculate this with the equations in the textbook, just don't use the numbers I supplied to you in the course notes.

5. (10 pts) Problem 10.13, Page 377 in the Carroll and Ostlie textbook.

6. (20 pts) Problem 10.15, Page 377 in the Carroll and Ostlie textbook. Use the equations in the textbook and not from your notes here.

7. (10 pts) Problem 10.16, Page 377 in the Carroll and Ostlie textbook.

8. (20 pts) Problem 12.4, Page 479 in the Carroll and Ostlie textbook.

9. (20 pts) Problem 13.5, Page 537 in the Carroll and Ostlie textbook.

10. (10 pts) Problem 13.15, Page 539 in the Carroll and Ostlie textbook.

11. (20 pts) Suppose an electron with a kinetic energy of 10^9 eV is moving through a magnetic field in a supernova remnant. If most of its radiated light is emitted at 100 MHz, what is the strength of the magnetic field? At what velocity is this electron moving? What is the mass of this electron?

12. (20 pts) Using the conservation of angular momentum ($L = m\omega r$), calculate how fast the Sun would spin if it were to collapse down to a neutron star. (Note that $P_\odot = 25$ days.)