

ASTR705 ISM

HW #10 – last one!

Due Friday, 4/28 in class

- 1) (2 pt each) Suppose that a shock wave propagates at velocity v_s through a fluid with preshock number density n_0 , preshock temperature $T_0 = 0$, and preshock magnetic field $B_0 = 0$. Assume the fluid is monatomic ideal gas of mean particle mass μ . Leave these in terms of variables if quantities are unknown.
 - a) What is the density n_s just behind the shock (postshock gas)?
 - b) What is the temperature T_s just behind the shock (postshock gas)?
 - c) What is the ratio of the thermal pressure $n_s k T_s$ postshock to the preshock “ram pressure” $n_0 \mu v_s^2$?
- 2) (3 pt) For a supernova in the Sedov-Taylor phase, derive a value for A in Equation 39.8:

$$R_s = A E^{1/5} \rho_0^{-1/5} t^{2/5}. \quad (1)$$

Assume that half of the total energy is ordered kinetic energy $E \approx 1/2 M v_s^2$, where M is the swept-up mass. Is your value close to the exact one in the textbook?