Physics 762 | Homework #4 | Spring '24

Dr. Drake

Due date March 15.

1. Consider an unmagnetized shock with upstream parameters, n_1, P_1 and v_1, where v_1 is along the normal to the shock.
   (a) Write down the jump conditions across the shock from the fluid equations (continuity, normal momentum and energy flux).
   (b) Eliminate the downstream pressure P_2 and velocity v_2 to obtain a solution for the compression ratio $r = n_2/n_1$ in terms of the upstream parameters. What is the compression ratio in the limit of high upstream Mach number?
   (c) Again taking the high Mach number limit, evaluate the downstream density n_2, the downstream flow speed v_2 and the downstream pressure P_2. What fraction of the incident kinetic energy flux $mn_1v_1^3/2$ is converted to thermal energy?