Due date March 1.

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 \( mn_1 v_1^2/2 \) is converted to thermal energy?