1. Derive an expression for density and temperature as a function of height \( \rho(z), T(z) \) for an isentropic stratified atmosphere in hydrostatic equilibrium. This will be just unstable to convection. Now do the same for an isothermal atmosphere. Take \( T(0) = T_0 \) for both (e.g., they have the same base temperature). Make a plot of \( T(z)/T_0 \) and \( \rho(z)/\rho_0 \) for both models on the same axes.

2. In our discussion on turbulence, we wrote a velocity correlation tensor in the form:

\[
R_{ij}(r) = \frac{1}{3} \nu^2 \left[ \frac{f(r) - g(r)}{r^2} r_i r_j + g(r) \delta_{ij} \right]
\] (1)

Show that the incompressibility condition, \( \partial R_{ij}/\partial r_i = 0 \) yields

\[
g(r) = f(r) + \frac{1}{2} r \frac{df}{dr}
\] (2)