

**[tex49] Pressure and mean square velocity in classical ideal gas**

A classical ideal gas consisting of  $N$  atoms of mass  $m$  is confined to a container of volume  $V$ . The gas in thermal equilibrium with the walls is described by a spatially uniform distribution of atomic positions and an isotropic distribution of velocities  $f(\mathbf{v})$ . Show that the pressure exerted on the container walls is

$$p = \frac{1}{3} \frac{N}{V} m \langle v^2 \rangle, \quad \text{where} \quad \langle v^2 \rangle = \int d^3v v^2 f(\mathbf{v}).$$

**Solution:**