Problem 26. Consider two-dimensional ideal gas at temperature $T$. Find the probability for a particle to have speed (absolute value of the velocity) within the interval $[v, v + dv]$. With the help of this distribution calculate the average kinetic energy of a particle? [6 points] (Useful integrals are collected in Table 12-1 of the textbook.)

Problem 27. $N$ molecules of mass $m$ are injected into a hollow cylinder (centrifuge) of radius $R$ and length $L$. Temperature is $T$. The cylinder is rotated with the angular velocity $\Omega$. Find concentration of molecules at a distance $r$ from the cylinder axis. [4 points]

Hint: use Boltzmann distribution for the concentration of molecules, $n \propto e^{-U/k_BT}$, where the effective potential energy in given by $U = -m\Omega^2r^2/2$. 