

### [tex71] Mean free path of particle in classical ideal gas

Given that the collision rate of particles (diameter  $d$ , mass  $m$ ) in a region of volume  $\Omega$  of a classical ideal gas with density  $n$  in thermal equilibrium at temperature  $T$  is  $R = 2\Omega d^2 n^2 \sqrt{\pi k_B T/m}$  as demonstrated in [tex70]. show that the average distance traveled by a particle between collisions (*mean free path*) is

$$\ell = \frac{1}{\sqrt{2}\pi d^2 n}.$$

**Solution:**