

M02T.1—Dilute Gas in Gravity

Problem

Consider a vertical container of dilute gas in a constant gravitational field. The bottom of the container is kept at temperature T ; otherwise it is thermally isolated.

- a) How does the density ρ vary as a function of height, h ?
- b) Under the assumptions used to derive this variation, what is the distribution vertical momenta $F(p)$ of the gas atoms at height h ?
- c) Assuming we have a (strictly) ideal gas of noninteracting particles should we expect the conclusion of part b) to hold?
- d) Assume the situation in c) and assume that the gas at the bottom has the momentum distribution characteristic of temperature T . What is the distribution of vertical momenta of the gas atoms at height h ?