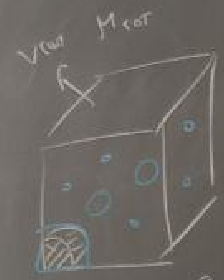
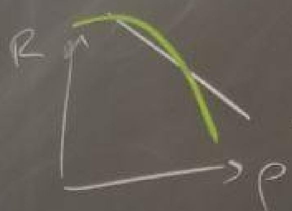




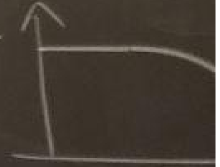
balance
- formation on dust
- destruction by Lyman Werner

$$c_s^2 + \sigma^2 = \frac{GM}{R} \leftarrow \alpha_{vir} = 1-2$$

$$\frac{dm_{H_2}}{dt} = \alpha_{dust}\, m_H\, m \ldots$$

$$\boxed{1 = \int P(\rho)\, d\rho} \qquad \boxed{\bar{\rho} = \int P(\rho)\,\rho\, d\rho} \qquad \sigma(R) = \left(\frac{R}{L}\right)^{1/2} \sigma(L)$$

$$x_{H_2} \in [0, 1]$$



$$\frac{\delta V}{V_{tot}} = P(\rho)\, d\rho \qquad \rho: 1\ H/cc \pm 0.1\ H/cc$$

① H_2

$$\bar{\rho}_{H_2} = \int P(\rho)\,\rho\, d\rho\; x_{H_2}(\rho) \qquad I_U$$

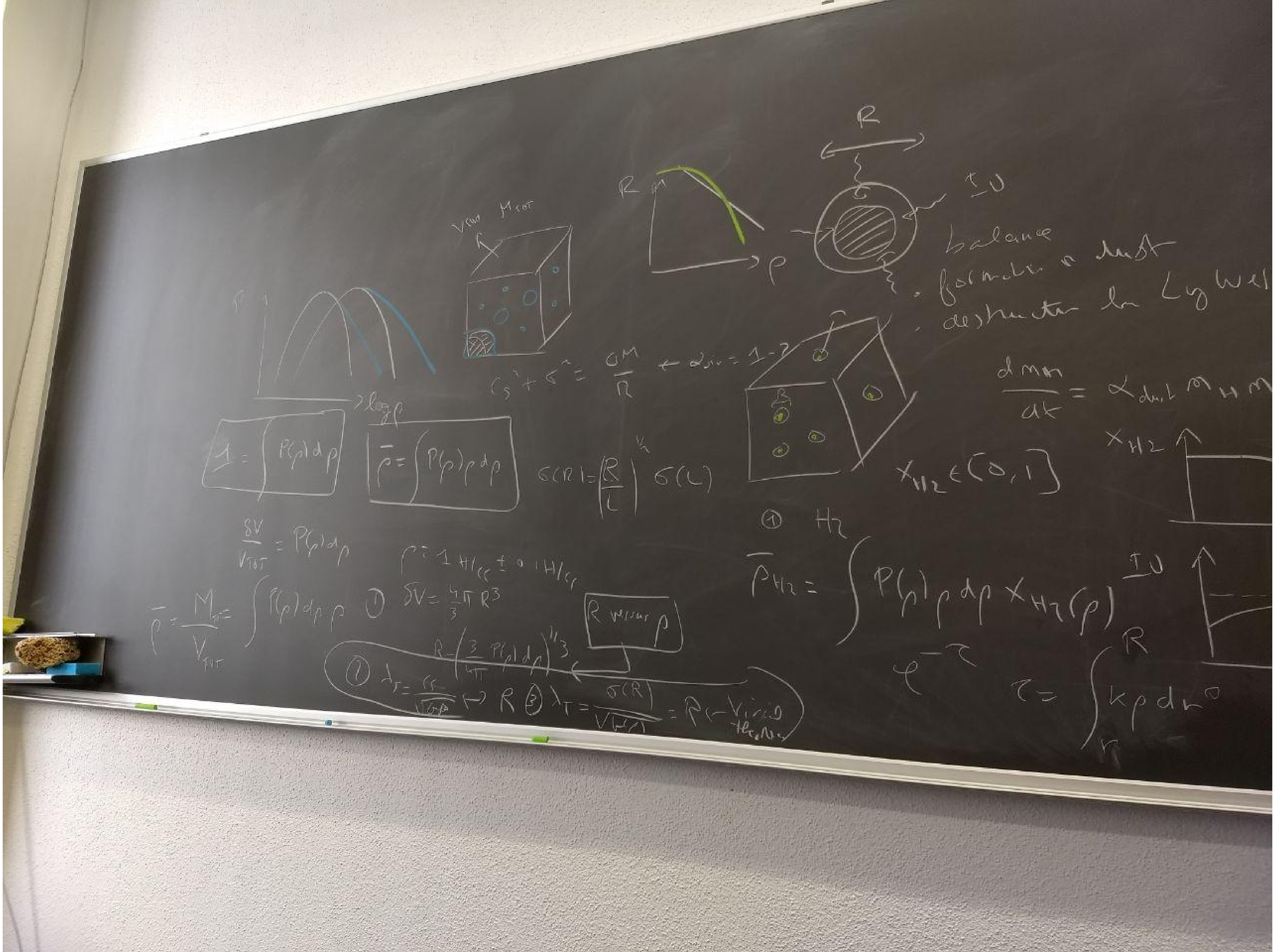
$$\bar{\rho} = \frac{M_{tot}}{V_{tot}} = \int P(\rho)\, d\rho\, \rho \qquad ① \ \delta V = \frac{4}{3}\pi R^3$$

$\boxed{R \text{ versus } \rho}$

$$R = \left(\frac{3}{4\pi} P(\rho)\, d\rho\right)^{1/3}$$

$$② \ \lambda_J = \frac{c_s}{\sqrt{G\rho}} \leftrightarrow R \quad ③ \ \lambda_J = \frac{\sigma(R)}{\sqrt{G\rho}} = R \ (\sim \text{Virial})$$

$$e^{-\tau} \qquad \tau = \int_{r_1}^{R} k\rho\, dr$$

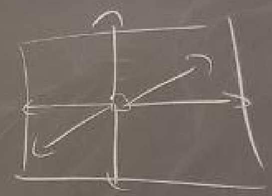


R
±U
balance
. formation dust
. destruction Lyman Werner
V_{TOT} M_{TOT}
ρ
$\log \rho$
$1 = \int P(\rho)\, d\rho$
$\bar{\rho} = \int P(\rho)\, \rho\, d\rho$
$c_s^2 + \sigma^2 = \frac{GM}{R}$ ← $\alpha_{vir} = 1-2$
$\sigma(R) = \left(\frac{R}{L}\right)^{1/2} \sigma(L)$
$\frac{dm_{H_2}}{dt} = \alpha_{dust}\, m_{HI}$
x_{H_2}
$x_{H_2} \in [0, 1]$
$\frac{\delta V}{V_{TOT}} = P(\rho)\, d\rho$
$\rho = 1\ H/cc \pm 0.1\ H/cc$
① H_2
$\bar{\rho}_{H_2} = \int P(\rho)\, \rho\, d\rho\, x_{H_2}(\rho)$
$\bar{\rho} = \frac{M_{tot}}{V_{tot}} = \int P(\rho)\, d\rho\, \rho$
① $\delta V = \frac{4}{3}\pi R^3$
R versus ρ
$R = \left(\frac{3}{4\pi} P(\rho)\, d\rho\right)^{1/3}$
① $\lambda_J = \frac{c_s}{\sqrt{G\rho}} \mapsto R$ ③ $\lambda_J = \frac{\sigma(R)}{\sqrt{G\rho}} = R$ ← Virial theorem
$e^{-\tau}$
$\tau = \int_r^R k \rho\, dr$

balance

- formation on dust
- destruction by Lyman Werner Rad

$$\frac{GM}{R} \leftarrow \alpha_{vir} = 1 - ?$$

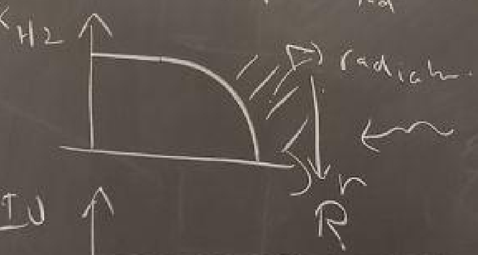


$$N_H = \int n_H \, dr = n_H \, r = n_H (R - r)$$

$$\frac{dn_{H_2}}{dt} = \alpha_{dust} \, n_H n_{H_2} - \Gamma_{rad} n_{H_2} = 0$$

$$N_{H_2} = n_H R$$

$$x_{H_2} \in [0, 1]$$



① H_2

$$\bar{\rho}_{H_2} = \int P(\rho) \rho \, d\rho \, x_{H_2}(\rho)$$

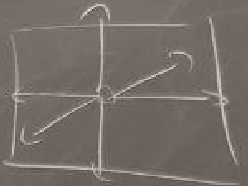
$$\boxed{\bar{X}_{H_2}} = \frac{\bar{\rho}_{H_2}}{\bar{\rho}} (\bar{\rho}, M, I_\nu)$$

$$e^{-\tau} \qquad \tau = \int_r^R \kappa \rho \, dr$$

ρ

balance

- formation on dust
- destruction by Lyman Werner Rad



$$\frac{dn_H}{dt} = \alpha_{dust}\, n_H n_{H_2} - \Gamma_{rad}\, n_{H_2} = 0$$

$$N_H = \int n_H\, dr = n_H\, r = n_H (R - r)$$

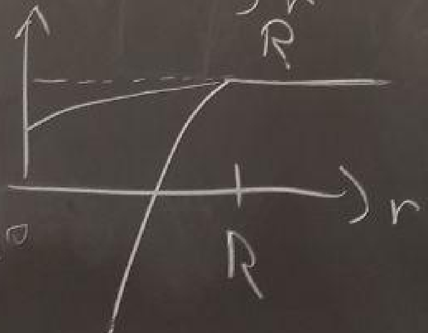
$$N_{H_2} = n_H R$$

$$x_{H_2} \in [0, 1]$$

$$\boxed{\bar{X}_{H_2}} = \frac{\bar{\rho}_{H_2}}{\bar{\rho}} (\bar{\rho}, M, I_U, Z)$$

H_2

$$= \int P(\rho)\, \rho\, d\rho\, x_{H_2}(\rho)$$



$$e^{-\tau} \qquad \tau = \int_r^R \kappa \rho\, dr$$