15.2

$$m_A = (\text{mass in amu}) \times \left(\frac{m_{amu}\ kg}{a.m.u.}\right)$$

$$= (1\ amu)\left(\frac{m_{amu}\ kg}{a.m.u.}\right)$$

$$= 1 \times 1.66 \times 10^{-27}\ kg.$$

$M_{Jeans} = \text{- - -}$.

$$F = ma$$

$$\frac{GM(r)m}{r^2} = ma$$

$$r = r_0 + V_0 t + \frac{1}{2}at^2$$

$$r = \frac{1}{2}at^2$$

$$t = \sqrt{\frac{2r}{a}}$$

$$= \sqrt{\frac{2r \cdot r^2}{GM(r)}}$$

$$= \sqrt{\frac{2r^3}{GM(r)}}, \quad M(r) = \frac{4\pi r^3}{3}\rho$$

miro

15.5 a)

$$\frac{dM}{dt} = \rho v \pi R^2 F_g$$

velocity dispersion

$$= \rho v \pi R^2 \left(1 + \left(\frac{v_e}{v_\infty}\right)^2\right)$$

$$= \rho v \pi R^2 \left(1 + \left(\frac{\left(\frac{GM}{R}\right)^{1/2}}{\left(\frac{2gm}{C_D \rho_g A}\right)^{1/2}}\right)\right)$$

$\rho = \frac{3M}{4\pi R^3}$

weight

effective cross-sectional area of body

drag coefficient ≈ 1 for sphere

local density of atmosphere

$$\frac{dR}{dt} = \left(\frac{3}{\pi}\right)^{1/2} \frac{\sigma_\rho n}{\rho} F_g$$

surface density: $100\ kg\ m^{-2}$

$$\left(\frac{GM_*}{a^3}\right)^{1/2} = n$$

Mass of star $3M_\odot$ in this question

mean motion

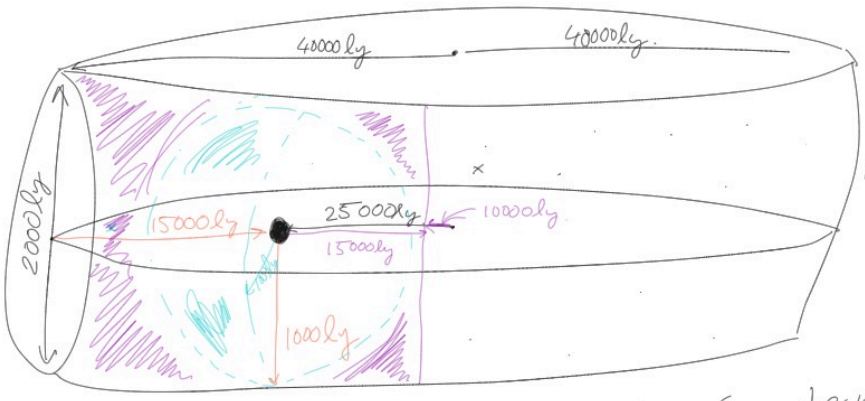
a = distance = 2 AU in this question

b) Isolation Mass:

$$M_{iso} \approx 5 \times 10^{20} \left(r_{AU}^2 \sigma_\rho\right)^{3/2} \left(\frac{M_\odot}{M_*}\right)^{1/2}$$

miro

16)



$\rho_{cc} = \frac{N_{cc}}{V}$

$N_{cc} = \rho_{cc} V$

If N_{cc} is only a few (ie. doesn't fit in Purple or blue regions)
then there's 1 cc / 30000ly. ⇒ only 2 civilizations?

$d(N_{cc}) = N_{cc}\, 4\pi r^2$?

$= \frac{4}{3} N_{cc}^3$ =?

miro