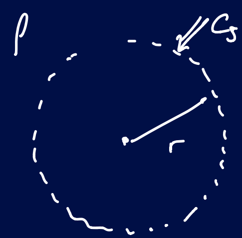
i) Accretion rate



$$\dot{M} = 4\pi r^2 . \rho . c_s$$

$$R_B = \frac{GM}{2c_s^2}$$

$$\therefore \dot{M} = 4\pi \frac{(GM)^2}{4 c_s^4} . \rho . c_s$$

$$= \frac{\pi G^2 \rho}{c_s^3} M^2 = k M^2$$

ii)

$$\frac{dM}{dt} = kM^2$$

$$\frac{dM}{M^2} = k\, dt$$

$$\left[-\frac{1}{M} \right]_{M_0}^{M(t)} = kt$$

$$\frac{1}{M_0} - \frac{1}{M(t)} = kt$$

$$\frac{1}{M_0} - kt = \frac{1}{M(t)}$$

$$M(t) = \frac{M_0}{1 - M_0 k t}$$

iii) It goes to ∞ at finite t

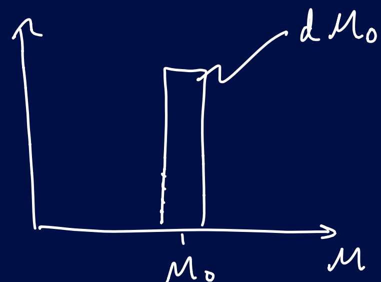
iv) $$\frac{dM}{dM_0} = \frac{1}{(1-M_0 kt)} + \frac{M_0 . (+kt)}{(1-M_0 kt)^2}$$

$$= \frac{1 - M_0 kt + M_0 kt}{(1-M_0 kt)^2}$$

$$= \frac{1}{(1-M_0 kt)^2}$$

$$= \frac{M(t)^2}{M_0^2}$$ //

v)



Flat dist. ∴ N_p in $M_0 \to M_0 + dM_0$ $\propto dM_0 \propto dM \frac{M_0^2}{M^2}$

∴ $N_p \propto M^{-2}$

i.e., close to the mass distribution of detected exoplanets //