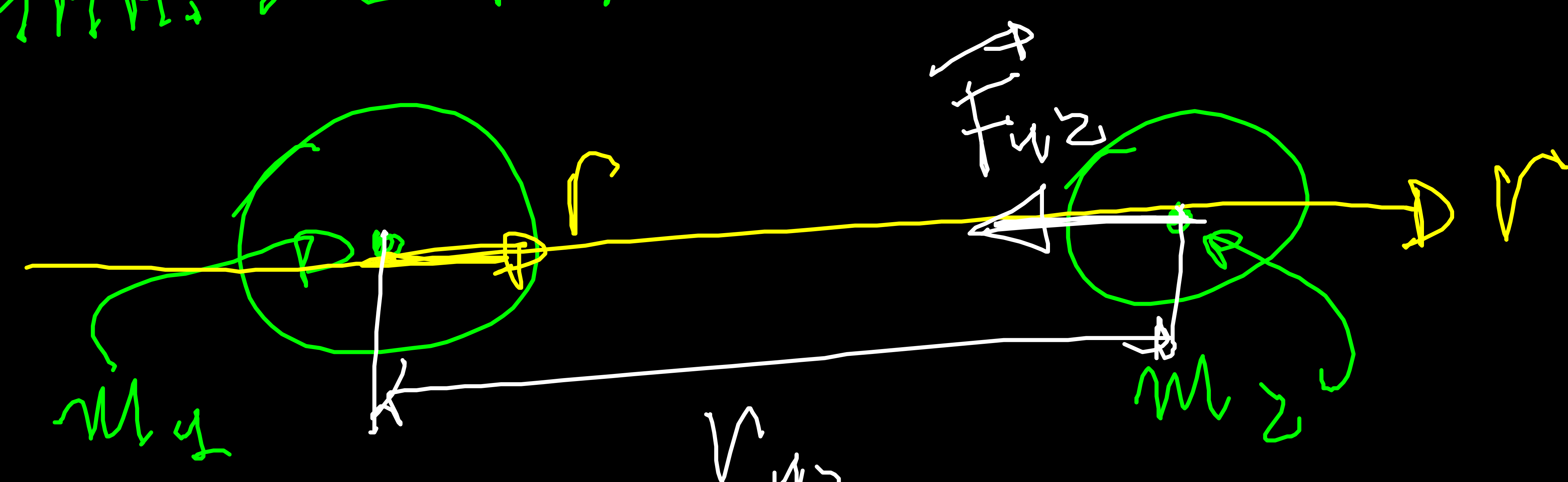
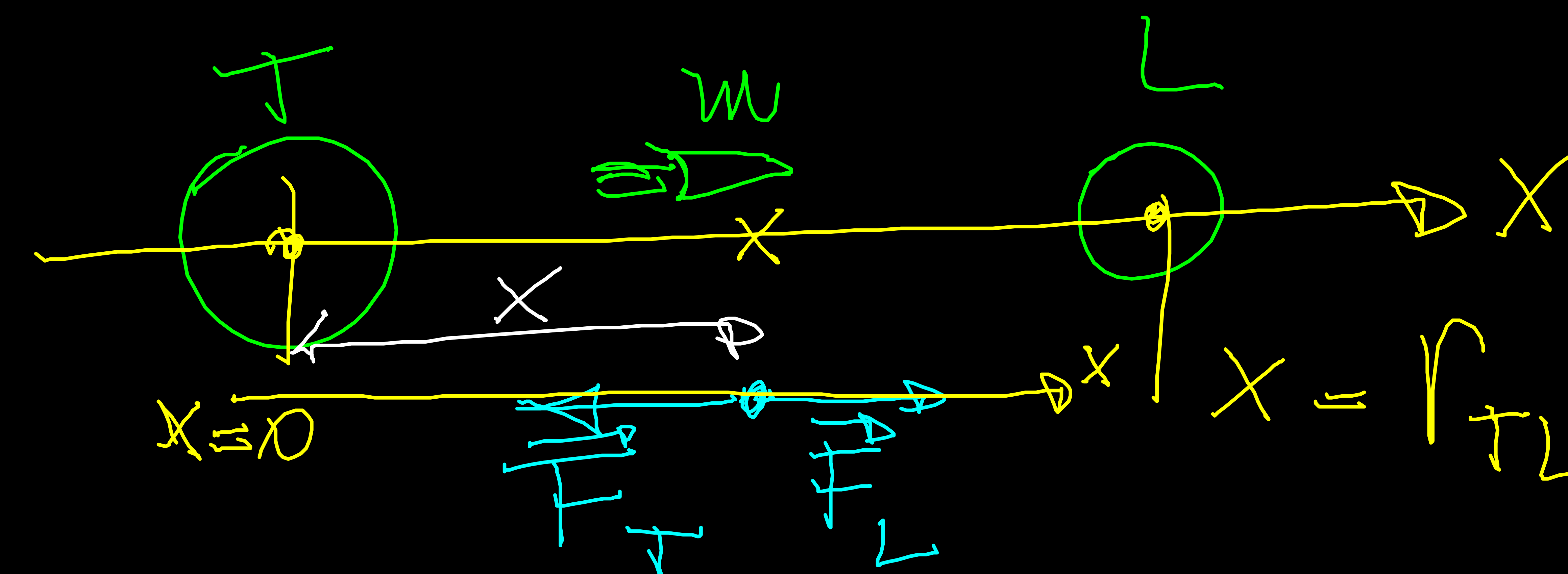
GRAVITAZIONE UNIVERSALE → ESEMPI

SIMM. SFERICA



$$\vec F_{12} = -\frac{G m_1 m_2}{r_{12}^2}\,\hat r$$



$$-\frac{G M_T m}{x^2} + \frac{G M_L m}{(r_{TL}-x)^2} = 0$$

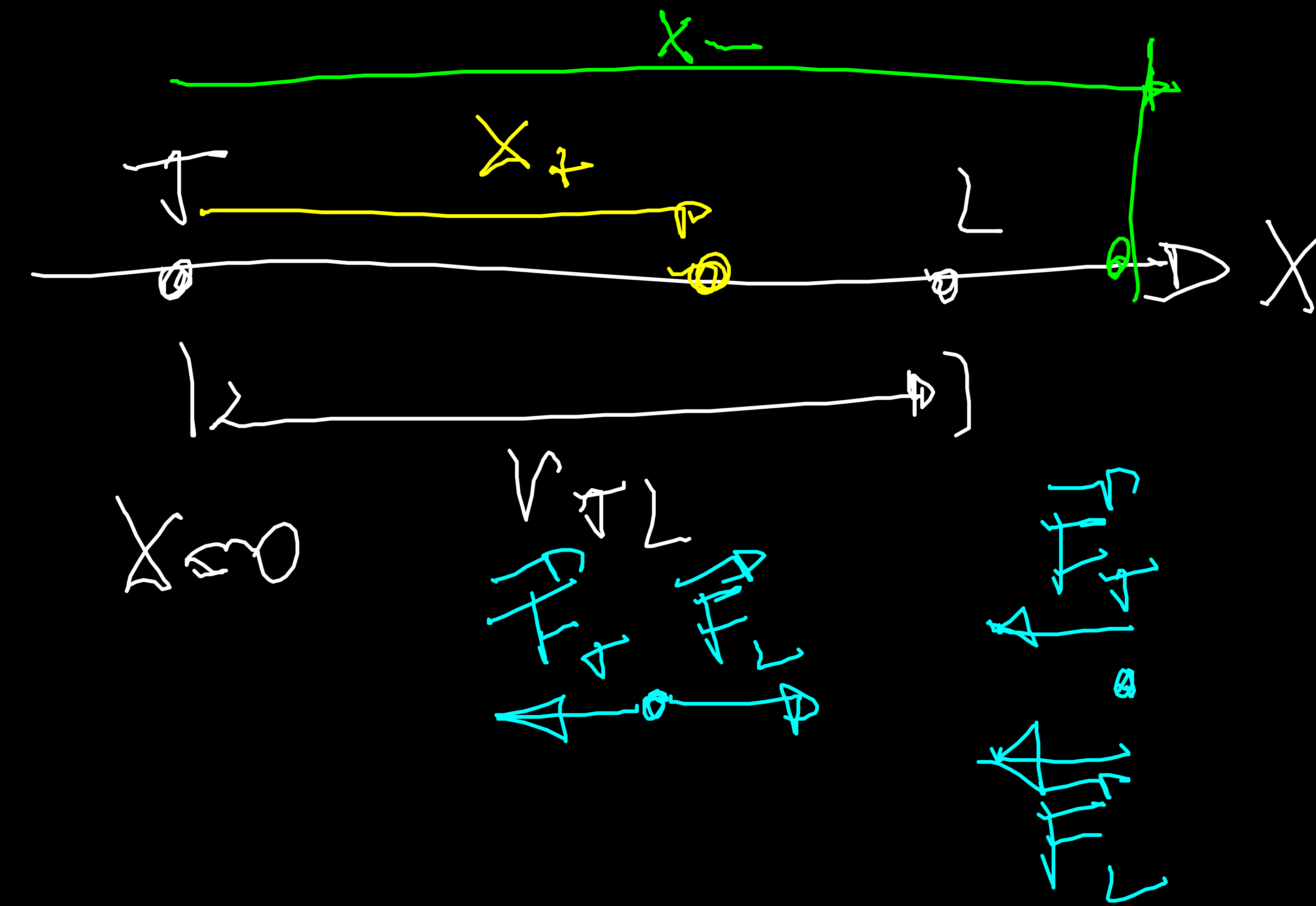
$$M_T (r_{TL}-x)^2 = M_L x^2$$

$$\left(1-\frac{M_L}{M_T}\right)x^2 - 2 r_{TL} x + r_{TL}^2 = 0$$

$$X = \frac{r_{TL}}{1 \pm \sqrt{\frac{M_L}{M_T}}}$$

(+) $$X_+ = \frac{r_{TL}}{1 + \sqrt{\frac{M_L}{M_T}}} < r_{TL}$$

(−) $$X_- = \frac{r_{TL}}{1 - \sqrt{\frac{M_L}{M_T}}} > r_{TL}$$



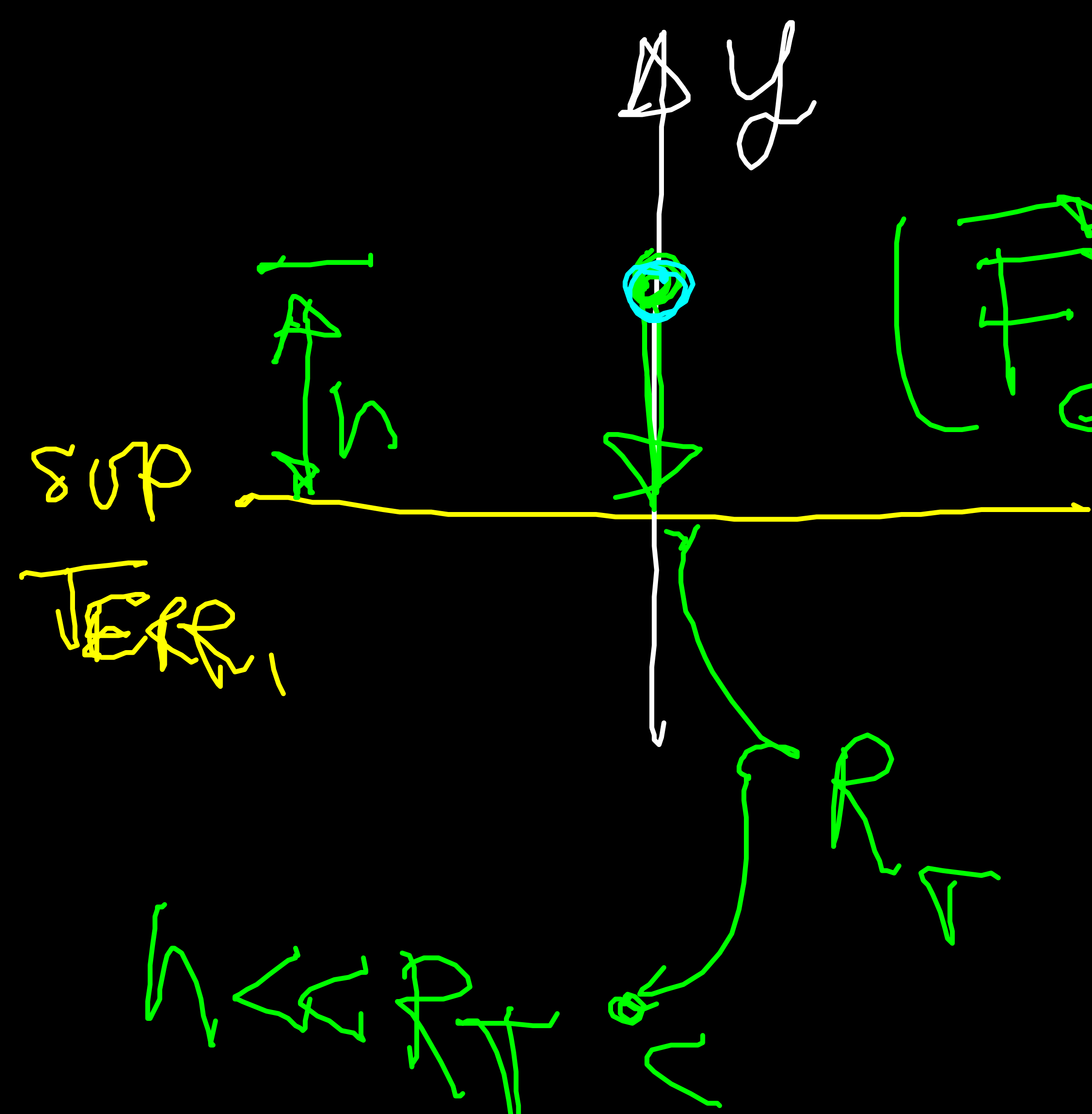
MASSA INERZIALE E MASSA GRAVITAZIONALE

II PR. DI NEWTON

$$\sum_{i=1}^{n} \vec{F}_i = m_I \vec{a}$$

GRAV. UNIV.

$$|\vec{F}_{12}| = \frac{G m_1 m_G}{r_{12}^2}$$



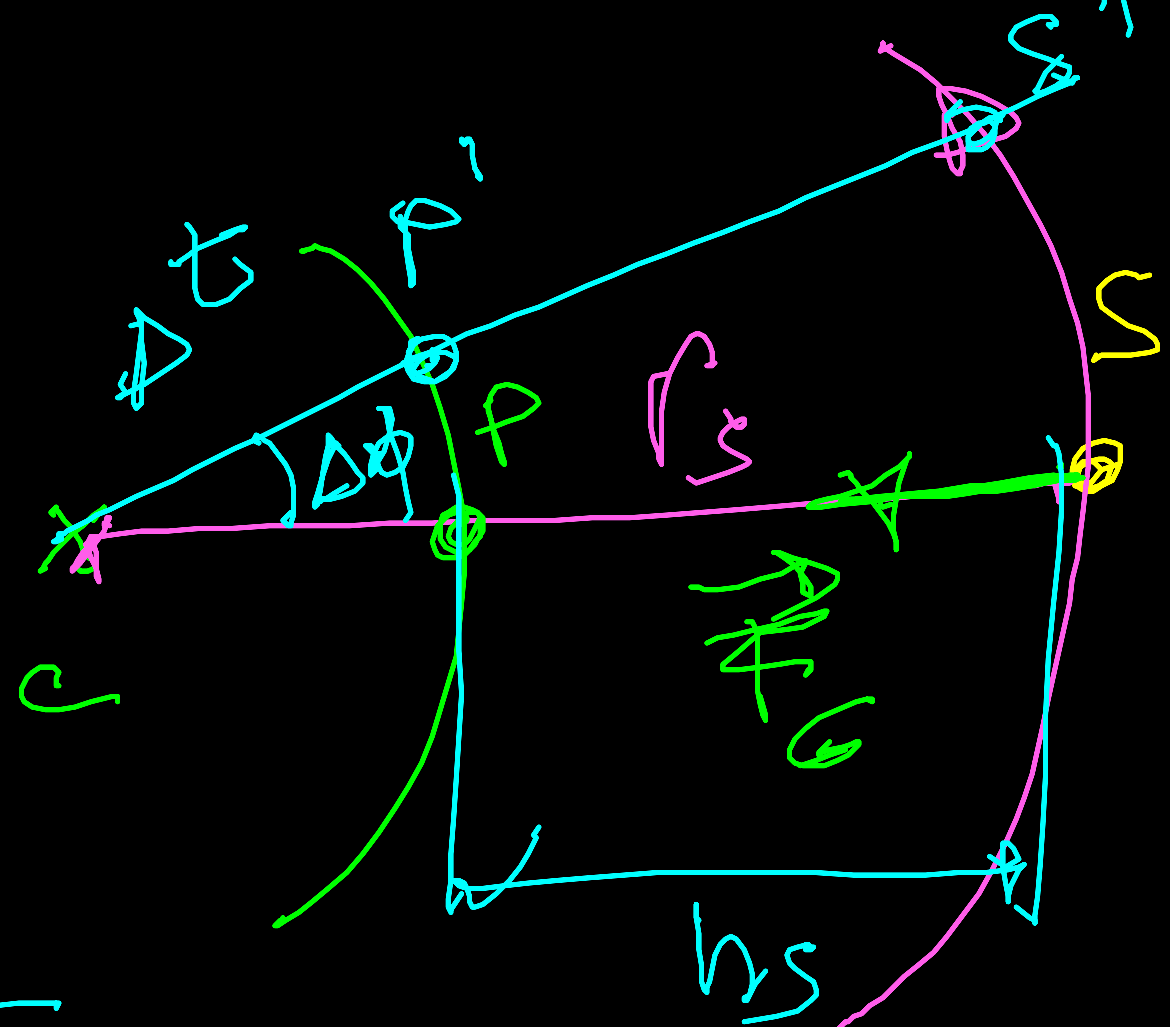
$$(\vec{F}_G)_y = -\frac{G M_T m_G}{(R_T + h)^2} \simeq -\frac{G M_T m_G}{R_T^2}$$

MISURO $a_y \Rightarrow m_I a_y = (\vec{F}_{12})_y = -\frac{G M_T m_G}{R_T^2}$

$$a_y = -\left(\frac{m_G}{m_I}\right) \frac{G M_T}{R_T^2} = g \Rightarrow m_I = \left(\frac{G M_T}{R_T^2 g}\right) m_G$$

(SP)

SATELLITE GEOSTAZIONARIO



→ MOTO CIRC. UNIFORME
CON VEL. ANGOLARE $\omega_s = \frac{2\pi}{T_s}$

$$|\vec F_G| = \frac{G M_T m_s}{r_s^2} = a_c = m_s \omega_s^2 r_s$$

$T_s = 86400\ s$

$G = 6{,}67 \times 10^{-11}\ \frac{N \cdot m^2}{Kg^2}$

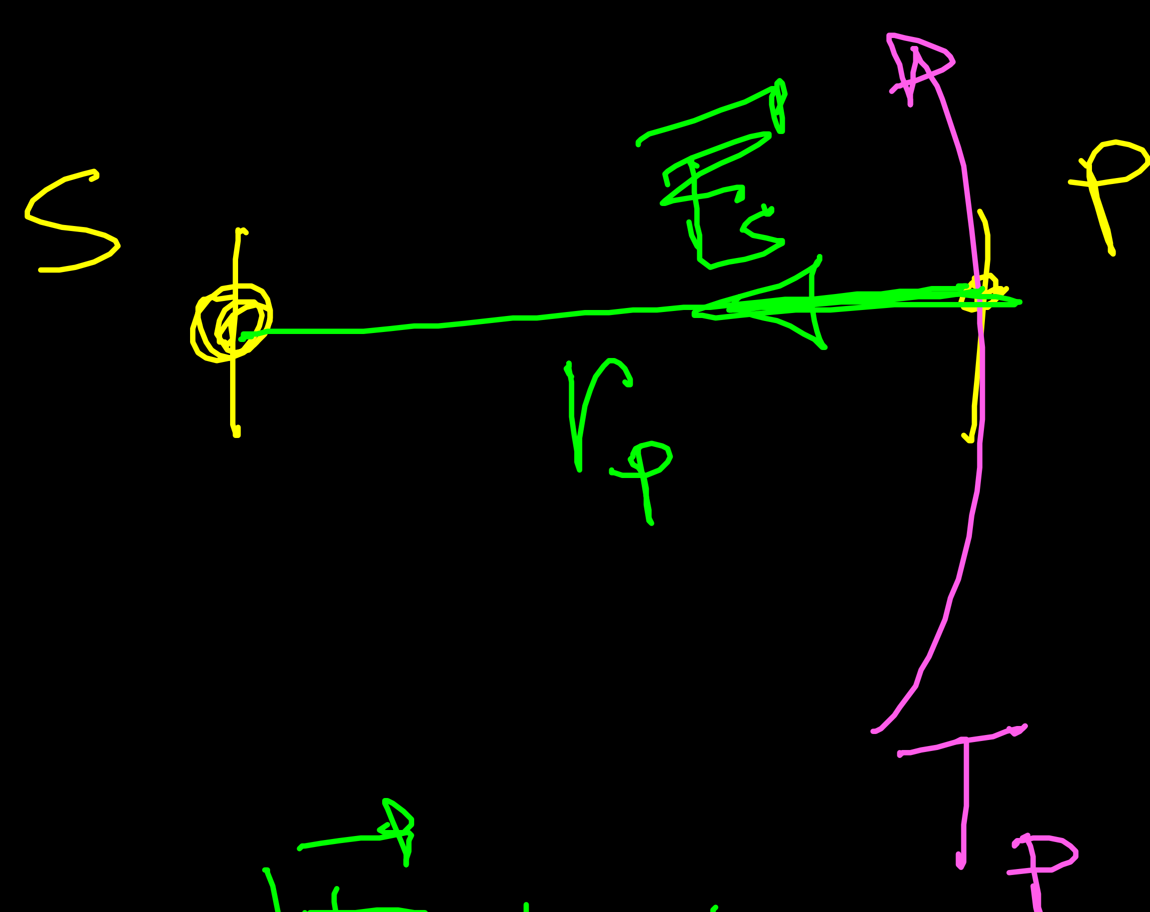
$$\frac{G M_T}{r_s^2} = \omega_s^2 r_s \Rightarrow r_s^3 \Rightarrow r_s = \sqrt[3]{\frac{G M_T}{\omega_s^2}} = \sqrt[3]{\frac{G M_T}{4\pi^2} T^2}$$

$M_T \simeq 5{,}98 \times 10^{24}\ Kg$

$r_s = 42 \times 10^6\ m = 42000\ Km$

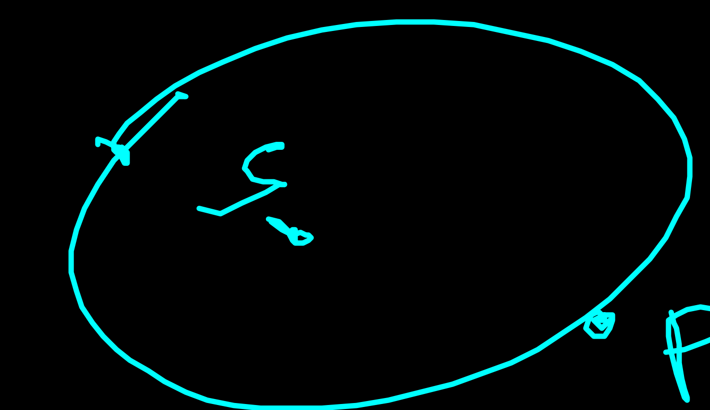
$h_s = 35600\ Km$

$$r_S^3 = \frac{GM_T}{4\pi^2} T_S^2$$

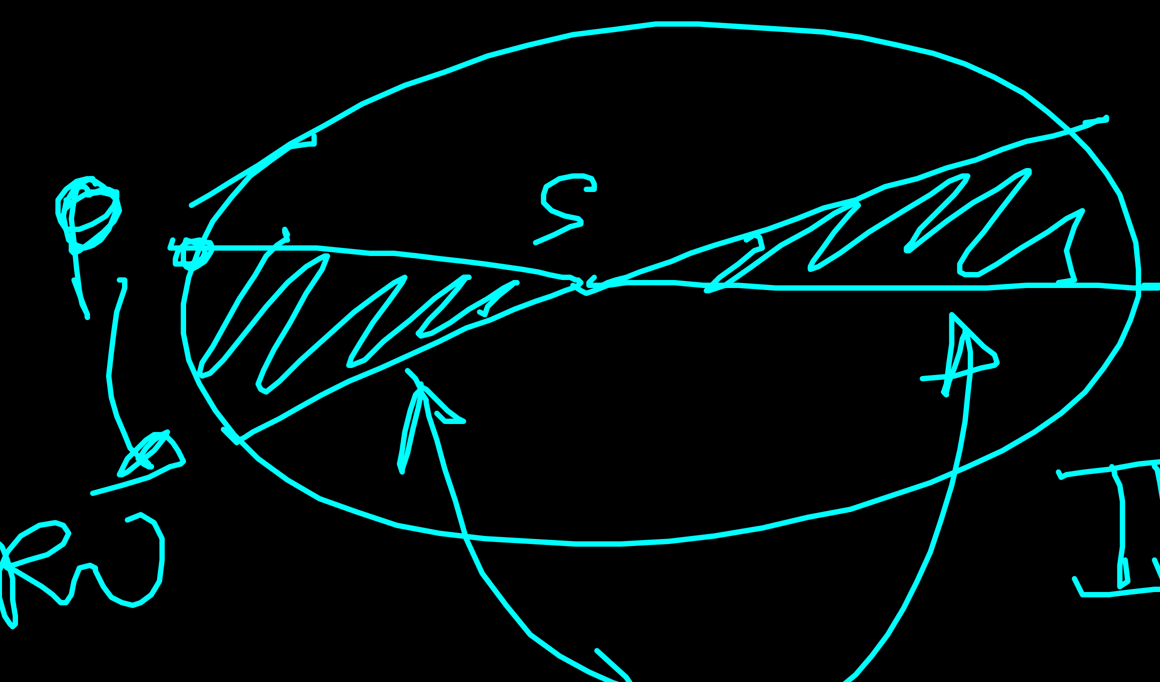


$$r_p^3 = \frac{GM_S}{4\pi^2} T_p^2$$

III L. DI KEPLERO



I K



II K

$A_1 = A_2$

Per Δt

$$|\vec{F}_S| = |\vec{F}_c| = \frac{M_p 4\pi^2}{T^2} r_p = \frac{G M_S M_p}{r_p^3}$$