№1

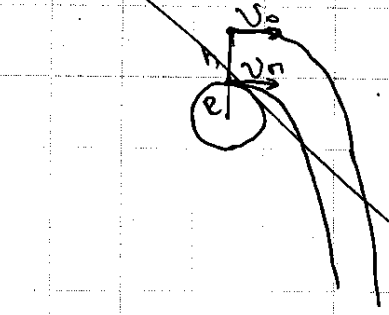
$$\frac{T_0^2}{T_x^2} = \frac{a_0^3}{a_x^3}$$

$a_x = 16$ км/с²
$a_0 = 8$ км/с²
$V_c \approx 250$ км/с
$T_0 = \frac{2\pi R_0}{V_c} = 2000$ минут

$$T_x = T_0 \sqrt{\frac{a_x^3}{a_0^3}} = 2{,}82\, T_0$$

$T_x \approx 5640$ минут

№2



$$V_0 = V + \frac{V_п}{5} = V_п$$

$$V = \sqrt{\frac{GM}{R+h}}$$

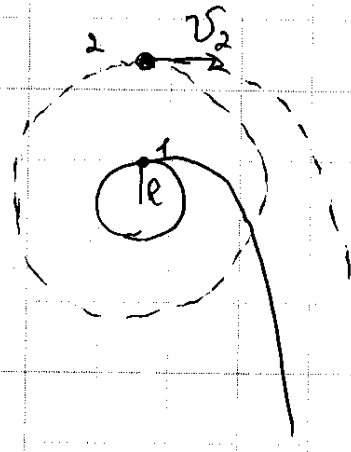
$$V_п^2 R = GM$$

$$V = \frac{4}{5} V_п$$

$$\frac{1}{R+h} = \frac{16}{25} \cdot \frac{2}{R}$$

$$25R = 32R + 32h$$

№2



$$v_1 = \sqrt{\frac{2GM}{R}}$$

$$v_2 = v_0 + \frac{1}{5}v_1$$

$$v_0 = \sqrt{\frac{GM}{R+h}}$$

$$v_2 = \sqrt{\frac{2GM}{R+h}}$$

$$\sqrt{\frac{2GM}{R+h}} = \sqrt{\frac{GM}{R+h}} + \frac{1}{5}\cdot\sqrt{\frac{2GM}{R}}$$

$$(\sqrt{2}-1)\sqrt{\frac{GM}{R+h}} = \frac{1}{5}\cdot\sqrt{\frac{2GM}{R}}$$

$$\frac{4,3}{R+h} = \frac{2}{R}$$

$$\frac{h}{R} = 1,3$$

№4

$$\rho = \frac{m}{V}$$

$$\rho_{min} = \frac{m_{min}}{V}$$

$R_{z.g} \approx 10$ км

$$V = \frac{4}{3}\pi R_{z.g}^3 = 4,2\cdot 10^{12}\ м^3$$

$$m \approx m_\odot \cdot 10^{-7}\,\frac{K}{T}$$

$$m_{min} \approx m_\odot \cdot 10^{-7}\,\frac{K}{T_{max}}$$

Предположим что звезда типа А0 сошла с Г.П. и превратилась в $R_{z.g}$

$T_{A0} \approx 30000$ К

$$\rho_{min} = \frac{10^{-7}\, m_\odot K}{V \cdot T_{max}} = \frac{1500000}{} = \text{[illegible]}\ кг/м^3$$

№3

Решим, пренебрегая поглощением света в атмосфере.

$m_1 = -1^m$

$m_2 = +10^m$

$m_2 - m_1 = -2{,}5 \lg\left(\frac{E_{A2}}{E_{A1}}\right)$

$E_2 = \frac{L}{4\pi x^2}$ $\quad x^2 = (h+R)^2 + R^2$

$E_1 = \frac{L}{4\pi h^2}$

$\frac{E_2}{E_1} = \frac{h^2}{x^2}$ «

$\frac{x^2}{h^2} \approx 25000$

~~$h^2 + 2hR + R^2 = 25000h^2$~~

~~$h = 25000 - 2R = 12200$~~

~~25000~~

$h^2 + 2hR + 2R^2 = 25000h$

$h^2 + 12800h + (8190000) - 25000h = 0$

$h^2 - 12200h + 8190000 = 0$

$D \approx$

$x^2 = 25000h^2$

$h^2 + 2hR = 25000h^2$

$24999h = 2R$

$h = 500$ м

№5

$N_1 = 1000$

$M_1 = 0^m$

$\Delta m = 10^m$

$N_2 = 1000000$

$L_2 = L_\odot$

$m_{РЗС} = m_{ИЗС} + 10^m$

$M_\odot = +4{,}8^m$

$M_1 - M_\odot = -2{,}5 \lg\left(\frac{L_{\odot 1}}{L_{\odot 2}}\right)$

$\frac{L_\odot}{L_{\odot 1}} = 10^{-\frac{4{,}8}{2{,}5}} = 0{,}012$

$L_1 = \frac{85}{100} L_\odot$

$L_{РЗС} = N_1 \cdot L_1 = \frac{85000}{100000} L_\odot$

$L_{ИЗС} = N_2 \cdot L_2 = 1000000\, L_\odot$

$\Delta m = -2{,}5 \lg\left(\frac{E_{ИЗС}}{E_{РЗС}}\right)$

$10^4 = \frac{E_{РЗС}}{E_{ИЗС}} = \frac{\frac{L_{РЗС}}{4\pi x^2}}{\frac{L_{ИЗС}}{4\pi y^2}} =$

$10000 = \frac{E_{ИЗС}}{E_{РЗС}} = \frac{10000000}{4\pi x^2} \cdot \frac{4\pi y^2}{\frac{100000}{85000} L_\odot} = \frac{100}{8{,}5} \cdot \frac{y^2}{x^2}$

$1000 = \frac{y^2}{x^2} = 850$

$x^2 = \frac{y^2}{\frac{1000}{850}}$ – для x-max угол должно быть мал

Возьмем $B_{РЗС}$ на другом конце Галактики от Солнца.

$y = (16+8)\,кпк = 24\,кпк$

$x = \frac{24}{\sqrt{\frac{1000}{850}}} \approx \frac{82}{100}\,кпк \approx 0{,}82\,кпк = 820\,пк$