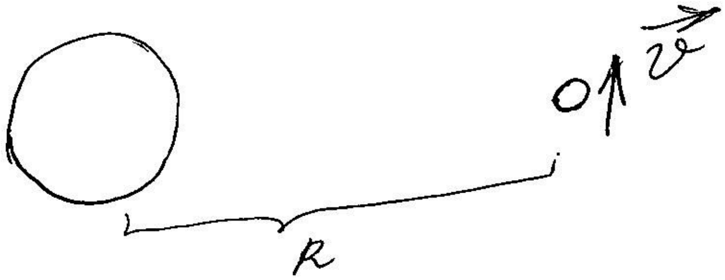
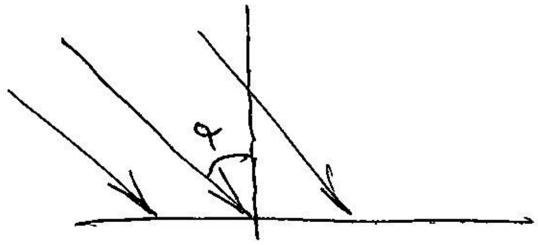
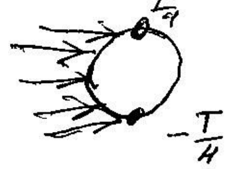
лист-1 Бел-13
11 класс

Задача 3





за день пол для α меня-ється от 90° до − 90°



Дано:
$S = 100\ м^2$
$T_0 = 4$ год
$T = 20$ ч
$\eta = 0{,}1$
$L_\odot = 4 \cdot 10^2$ Вт
$M_\odot = 2 \cdot 10^{30}$ кг
$G = 6\frac{2}{3} \cdot 10^{-11} \frac{м^3}{кг \cdot с}$

$Q - ?$

1) $L = 2\pi \cdot R$

$$v = \frac{L}{T_0} = \sqrt{\frac{G \cdot M}{R}}$$

$$\frac{2\pi R}{T_0} = \sqrt{\frac{G \cdot M}{R}}$$

$$\frac{4\pi^2 R^3}{T_0^2} = G\, 2M_\odot$$

$$R = \sqrt[3]{\frac{G \cdot 2M_\odot \cdot T_0^2}{4\pi^2}}$$

2) ~~$\delta Q = L_з \cdot \left(\frac{R}{R_з}\right)^2$~~

$$\delta Q = L_з \cdot \frac{S}{4\pi R^2} \cdot dt \cdot \eta \cdot \cos(\omega \cdot t)$$

$$\frac{L_з}{L_\odot} = \left(\frac{2M_\odot}{M_\odot}\right)^4$$

$$L_з = 16 \cdot L_\odot$$

$$\delta Q = 16 \cdot L_\odot \cdot \frac{S}{4\pi \cdot R^2} \cdot dt \cdot \eta \cdot \cos(\omega \cdot t)$$

$$\omega = \frac{2\pi}{T}$$

$$\delta Q = 16 \cdot L_\odot \cdot \frac{S}{4\pi R^2} \cdot dt \cdot \eta \cdot \cos\left(\frac{2\pi t}{T}\right)$$

$$Q = \int_{-\frac{T}{4}}^{\frac{T}{4}} 16 L_\odot \cdot \frac{S}{4\pi R^2} \cdot \eta \cdot \cos\left(\frac{2\pi t}{T}\right) \cdot dt$$

$$Q = 32 L_\odot \cdot \frac{S}{4\pi R^2} \cdot 2 \cdot \frac{T}{4 \cdot 2\pi} \cdot \frac{T}{4}$$

$$Q = \frac{L_\odot \cdot S \cdot T^2 \cdot 2}{4\pi^2 R^2}$$

$$R = \sqrt[3]{\frac{6{,}7 \cdot 10^{11} \cdot 2 \cdot 2 \cdot 10^{30} \cdot 4 \cdot 365 \cdot 24 \cdot 60^2}{4 \cdot 3^2 \cdot 365 \cdot 24 \cdot}} \text{ м}$$

$$R = \sqrt[3]{\frac{20 \cdot 16 \cdot 24 \cdot 60^2 \cdot 10^{30} \cdot 365}{4 \cdot 3^2 \cdot 10}} \text{ м}$$

$$R = \frac{60}{3} \cdot \sqrt[3]{4 \cdot 24 \cdot 2 \cdot 10^{30} \cdot 60} \text{ м}$$

$$R = \frac{60 \cdot 10^{10} \cdot 2\sqrt[3]{24 \cdot 60}}{3} \text{ м}$$

$$R = \frac{60 \cdot 10^{14} \cdot 2{,}1}{3} \text{ м}$$

$$R = 42 \cdot 10^{14} \text{ м}$$

$$Q = \frac{4 \cdot 10^{20} \cdot 100 \cdot (20 \cdot 60 \cdot 60)^2 \cdot 0{,}1}{4 \cdot 3^2 \cdot (42 \cdot 10^{14})^2}$$

$$Q = \frac{(72 \cdot 1000)^2 \cdot 0{,}1}{3^2 \cdot (42^2)}$$

$$Q = \left(\frac{72}{3 \cdot 42}\right)^2 \cdot 10^5$$

$$Q = \left(\frac{8^2}{4}\right) \cdot 10^5$$

$$Q = \left(\frac{4}{7}\right)^2 \cdot 10^5$$

$$Q = (0{,}57)^2 \cdot 10^5$$

$$Q = 32500$$

$$R = \sqrt[3]{\frac{20 \cdot 16 \cdot 60^4 \cdot 24 \cdot 10^{29}}{4 \cdot 3^2 \cdot 3}} \text{ м}$$

$$R = \frac{60 \cdot 2\sqrt[3]{\frac{60 \cdot 20 \cdot 24 \cdot 2}{4 \cdot 10}}}{3} \cdot 10^{10} \text{ м}$$

$$R = 40 \cdot 10^{10} \sqrt[3]{3 \cdot 20 \cdot 24} \text{ м}$$

$$R = 8 \cdot 10^{11} \sqrt[3]{180} \text{ м}$$

$$R = 8{,}5{,}6 \cdot 10^{11} \text{ м}$$

$$R = 45 \cdot 10^{11} \text{ м}$$

45
×45
225
180
2025
1911 25
+8100
9111 25

$$Q = \frac{4 \cdot 10^{26} \cdot 100 \cdot (20 \cdot 60 \cdot 60)^2 \cdot 0,1}{4 \cdot 3^2 \cdot (45 \cdot 10^{11})^2} \text{ Дж}$$

$$Q = \frac{10^5 \cdot (20 \cdot 60 \cdot 4)^2}{4 \cdot 3^2 \cdot (3^2 \cdot$$

$$Q = \frac{10^9 \cdot 4 \cdot 36 \cdot 4}{3^4} \text{ Дж}$$

$$Q = \frac{16 \cdot 64}{9} \cdot 10^9 \text{ Дж}$$

$$Q = 7 \cdot 10^9 \text{ Дж}$$

$16 \cdot 4 = 40 + 24 = 64$

$64 \mid 9$

$63 \mid 7$

Ответ: 7 МДж

Задача 1

Дано:

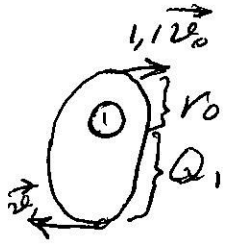
$T_0 = 24$ ч

$\Delta T_{12} - ?$

Решение:

предполагаемся:

1) $1,1 v_0 \cdot r_0 = v_1 \cdot Q_1$



$$v_1 = \sqrt{\frac{2M}{r_0 + Q_1}} \cdot \sqrt{\frac{r_0}{Q_1}}$$

$$1,1 v_0 \cdot r_0 = \sqrt{\frac{2M}{r_0 + Q_1}} \sqrt{\frac{r_0}{Q_1}} \cdot Q_1$$

$$(r_0 + Q_1)(1,1 v_0)^2 \cdot r_0 = 2 \cdot M \cdot Q_1$$

$$v_0 = \sqrt{\frac{M}{r_0}}$$

$$(r_0 + Q_1)(1,1)^2 \cdot M = 2M \cdot Q_1$$

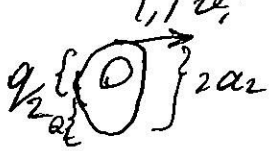
$$1,21 r_0 + 1,21 Q_1 = 2 Q_1$$

$$r_0 = \frac{0,79 Q_1}{1,21}$$

$$Q_1 = \frac{0,79}{1,21} \cdot r_0$$

$$Q_1 = \frac{121}{79} r_0$$

Бил – 13
11 класс

2) 

$1,1 v_1' = \sqrt{\frac{u}{a_1}}\sqrt{\frac{2a_2 - q_2}{q_2}}$

$1,1\sqrt{\frac{2u}{r_0+q_2}}\cdot\sqrt{\frac{r_0}{q_2}} = \sqrt{\frac{u}{a_2}}\cdot\sqrt{\frac{2a_2-q_2}{q_2}}$

$\frac{121\cdot 2\cdot r_0}{100(r_0+\frac{81}{119}r_0)} = \frac{2\cdot a_2 - \frac{81}{119}r_0}{a_2}$

$\frac{120\cdot 2\cdot a_2}{(1+\frac{80}{120})\cdot 100} = 2a_2 - \frac{80}{120}r_0$

$\frac{120\cdot 2\cdot a_2\cdot 120}{(120+80)\cdot 100} = \frac{24a_2 - 80r_0}{120}$

$\frac{12\cdot 12\cdot 2\cdot a_2}{200} = 2a_2 - \frac{2}{3}r_0$

$10\cdot 6\cdot 12\cdot 2\cdot a_2 = (20a_2 - \frac{20}{3}r_0)\cdot 100$

$12^2 a_2 = 200a_2 - \frac{200}{3}r_0$

$144a_2 = 200a_2 - \frac{200}{3}r_0$

$18a_2 = 25a_2 - \frac{25}{3}r_0$

$25r_0 = 3(25-18)a_2$

$25r_0 = 21a_2$

$a_2 = \frac{25}{21}r_0$

III закон Кеплера:

$\frac{T_1^2}{T_2^2} = \frac{T_1^2}{T_0^2} = \frac{a_1^3}{r_0^3}$

$T_1 = \frac{\sqrt{a_1}^3}{\sqrt{r_0}^3}T_0$

$\frac{T_2^2}{T_0^2} = \frac{a_2^3}{r_0^3}$

$T_2 = \frac{\sqrt{a_2}^3}{\sqrt{r_0}^3}T_0$

$$T_1 - T_2 = \frac{\sqrt{a_1}^3}{\sqrt{R_0}^3} T_0 - \frac{\sqrt{a_2}^3}{\sqrt{r_0}^3} T_0 = \sqrt{\frac{300 r_0}{27 r_0}}^3 T_0 - \sqrt{\frac{2T \cdot r_0}{25 \cdot r_0}}^3 T_0 =$$

$$= \sqrt{\frac{300}{270}}^3 T_0 - \frac{\sqrt{21}^3}{5} T_0 = T_0 \left(\sqrt{\frac{10}{9}}^3 - \frac{\sqrt{21}^3}{125} \right) =$$

$$= \left(\frac{\sqrt{10}^3}{27} - \frac{\sqrt{21}^3}{125} \right) \cdot 24 z = \left(\frac{3,2^3}{27} - \frac{4,6^3}{125} \right) \cdot 24 z =$$

$$= \left(\frac{32,0}{27} - \frac{96,6}{125} \right) \cdot 24 z = \left(\frac{32 \cdot 125 - 96,5 \cdot 27}{27 \cdot 125} \right) \cdot 24 z$$

$$= \left(\frac{4000 - 2600}{27 \cdot 125} \right) \cdot 24 z = \left(\frac{1400 \cdot 24}{27 \cdot 125} z = \frac{4 \cdot 14 \cdot 24}{27 \cdot 5} \right) =$$

$$= \left(\frac{32}{27} - \frac{125}{96,6} \right) T_0 = \left(\frac{32 \cdot 96,5 - 125 \cdot 27}{27 \cdot 96,5} \right) \cdot T_0 =$$

$$= 30800 = \left(\frac{3088 - 3375}{2500} \right) T_0 = -\frac{300}{2500} \cdot 24 z =$$

$$= -\frac{72}{25} = -2,88 z$$

Ответ: $T_2 - T_1 = 2,88 z$

Задача 4 11 класс

Дано:

$m = 5,7^m$

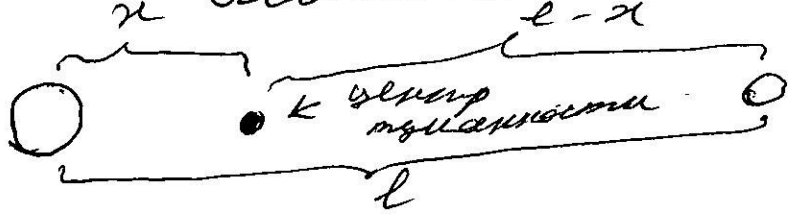
$M_0 = -2,5^m$

~~$\ell = 0,3$~~

$\ell = 310$ пк

$x - ?$

Решение:



1) $M_0 = m_0 + 5 - 5\lg\ell + A\cdot\ell$

$m_0 = M_0 - 5 + 5\lg\ell + A\cdot\ell$

$m_0 = -2,5 - 5 + 5\cdot 2,5 + 1,8\cdot 0,31$

$m_0 = 5,5$

2) $\frac{L_0}{L_x} = 10^{-0,4(m_0 - m)}$

$L_0 = 10^{-0,4(5,5-5,7)}$

$L_0 = 10^{0,4\cdot 0,2}\cdot L_x$

$L_0 = 1,2\,L_x$

$L_x = \frac{L_0}{1,2}$

3) $\frac{L_0 - L_x}{L_x \cdot \frac{(\ell-x)^2}{x^2}} + 1 \quad \frac{L_0 - L_x\frac{x^2}{(\ell-x)^2}}{L_x} = 1$

$\frac{(\ell-x)^2 1,9L_x - L_x\cdot x^2}{(\ell-x)^2} = L_x$

$1,9 \quad \frac{1,2L_x - L_x\frac{x^2}{(\ell-x)^2}}{L_x} = 1$

$1,2 - \frac{x^2}{(\ell-x)^2} = 1$

$\frac{x^2}{(\ell-x)^2} = 0,2$

$\left(\begin{array}{r} 45 \\ \times 45 \\ \hline 225 \\ +180 \\ \hline 2025 \end{array}\right)$

$\frac{x}{\ell-x} = \sqrt{0,2}$

$x = \sqrt{0,2}\,\ell - \sqrt{0,2}\,x$

шаг

$x = -0{,}45x + 0{,}45^{-}l$

$1{,}45x = 0{,}45^{-}l$

$x = \frac{0{,}45^{-}l}{1{,}45}$

$x = \frac{45^{-} \cdot 310}{145}$ пк

$x = \frac{9 \cdot 310}{29}$ пк

$x = \frac{9 \cdot 310}{30}$ пк

$x = 93$ пк

Ответ: 93 пк

Бел – 15
11 класс

центр тяжести между звездой и землей если звездная величина уменьшится.

Бел – В
11 класс

Задача 5

1) $E_{фо} = h \cdot \nu$

$$\nu = \frac{E_{фо}}{h}$$

2) $q \cdot B \cdot v_к = m \cdot a_ц$ (II з. Н.)

$$q \cdot B \cdot v_к = \frac{m \cdot v_к^2}{R}$$

$$\nu = \frac{2\pi R}{v_к}$$

$$\nu = \frac{1}{T}$$

$$\nu = \frac{v_к}{2\pi \cdot R}$$

$$\frac{E_{фо}}{h} = \frac{v_к}{2\pi \cdot R}$$

$$\frac{v_к}{R} = \frac{2\pi E_{фо}}{h}$$

$$q \cdot B = \frac{m \cdot v_к}{R}$$

$$q \cdot B = \frac{2 \cdot \pi \cdot E_{фо}}{h}$$

$$q = \frac{2\pi \cdot E_{фо}}{B \cdot h}$$

2)

$$0,9v_1 = \sqrt{\frac{M}{a_1}}\sqrt{\frac{2a_1 - Q_1}{Q_1}}$$

$T_0 = 24$ с,

$$0,9\sqrt{\frac{2M}{Q_1 + r_0}}\sqrt{\frac{r_0}{Q_1}} = \sqrt{\frac{M}{a_1}}\sqrt{\frac{2a_1 - a_1}{Q_1}}$$

$$\frac{81 \cdot 2 \cdot r_0}{100\left(\frac{121}{79}r_0 + r_0\right)} = \frac{2a_1 - \frac{121}{79}r_0}{a_1}$$

$$\frac{162 \cdot a_1 \cdot 79}{100 \cdot (121 + 79)} = 2a_1 - \frac{121}{79}r_0$$

$$162 \cdot 79 \cdot a_1 = 40000 \cdot a_1 - \frac{121 \cdot 20000}{79}r_0$$

$$160 \cdot 80 \cdot a_1 = 40000 a_1 - \frac{120 \cdot 20000}{80} \cdot r_0$$

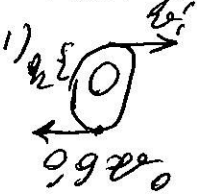
$$16 \cdot 8 \cdot a_1 = 400 \cdot a_1 - 120 \cdot 20 \cdot r_0$$

$$128 a_1 = 400 \cdot a_1 - 2400 r_0$$

$$400 a_1 - 128 a_1 = 300 r_0$$

$$a_1 = \frac{300}{272} r_0$$

получилось:



$$0,9v_0 \cdot r_0 = v_1' \cdot q_2$$

$$v_1' = \sqrt{\frac{2M}{r_0 + q_2}}\sqrt{\frac{r_0}{q_2}}$$

$$0,9v_0 \cdot r_0 = \sqrt{\frac{2M}{r_0 + q_2}}\sqrt{\frac{r_0}{q_2}} \cdot q_2$$

$$\frac{81}{100} v_0^2 \cdot r_0 = \frac{2q_2 \cdot M}{r_0 + q_2}$$

$$81 \cdot r_0^2 + 81 r_0 \cdot q_2 = 200 q_2 r_0$$

$$81 r_0 = 119 q_2$$

$$q_2 = \frac{81}{119} r_0$$