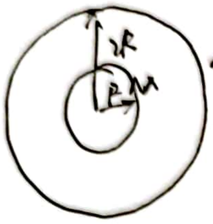
6. (a) $\Sigma F = \frac{GM_1 m}{a^2} + \frac{GM_2 m}{a^2} = \frac{GM(m_1+m_2)}{a^2} = 1.54\times10^{-8}$ N.

(b). $\Sigma F = \frac{GM_4 m}{b^2} = 1.85\times10^{-8}$ N.

(c) $\Sigma F = 0$.

13. 

由 Newton's law.

(a). $a_1 = \frac{GMm}{R^2\cdot m} = \frac{GM}{R^2} = \frac{6.67\times10^{-11}\times3\times10^{24}}{(12\times10^6)^2}$

$= 1.39\ m/s^2$

(b) $a_2 = \left(\frac{GMm}{9R^2} + \frac{G4M\cdot m}{9R^2}\right)\cdot\frac{1}{m} = \frac{G(M+4M)}{9R^2} = \frac{5GM}{9R^2}$

$= 0.77\ m/s^2$.

14. B点. $E_1 = \left(-\frac{GM_A m}{d}\right) + \left(-\frac{GM_C m}{(L-d)}\right)$.

B'点 $E_2 = \left(\left(-\frac{GM_A m}{L-d}\right) + \left(-\frac{GM_C m}{d}\right)\right)$.

W_{you} (done by you) $= E_1 - E_2 = -1.069\times10^{-12}$ J.

$W_{net} = 1.669\times10^{-12}$ J.

15. $F_{sun} = \frac{GM_{sun} m}{R^2}$ $F_{Ear} = \frac{GM_E m}{R_2^2}$ $\frac{F_{sun}}{F_{Ear}} = 2.16$.

(代入数据).

18 受力分析可得.

$G\frac{Mm_Y}{l^2} = \frac{Gmm_Y}{l^2}$ $\therefore M = m$.

$F = 0$, of course.

34. $\frac{Gm_1m_2}{(r_1+r_2)^2} = m_1\frac{v_1^2}{r_1}$

$r_1 = \frac{m_2 r}{m_1+m_2}$

$r = \frac{m_1+m_2}{m_2} r_1$. $r_1 = \frac{vT}{2\pi}$.

$\therefore \frac{4\pi^2 G m_1 m_2^2}{(m_1+m_2)^2 v^2 T^2} = \frac{2\pi m_1 v}{T}$

代入 $\frac{m_2^3}{(m_1+m_2)^2} = 3.06$ kg 解之. $m_2 \approx 9$ kg

52. (a) $T = 2\pi\sqrt{\frac{r^3}{GM}} \approx 5546$ s

(b) $v_0 = \sqrt{\frac{GM}{R}} = 7612$ m/s

(c) $K = \frac{1}{2}mv^2 = 4.3\times10^{10}$ J

(d) $U = -\frac{GMm}{R} = -8.83\times10^{10}$ J.

(e) $E = K+U = -4.5\times10^{10}$ J.

(f) $T = 2\pi\sqrt{\frac{a^3}{GM}} = 6385$ s.

(g) $\Delta T \approx 160$ s

3. 将球补全. $F_{原} = \frac{GMm}{d^2}$.

挖去 $F' = \frac{Gm\cdot\frac{1}{8}M}{(d-\frac{R}{2})^2}$. $\therefore \Sigma F = F_{原} - F' = 1.94\times10^{-8}$ N.