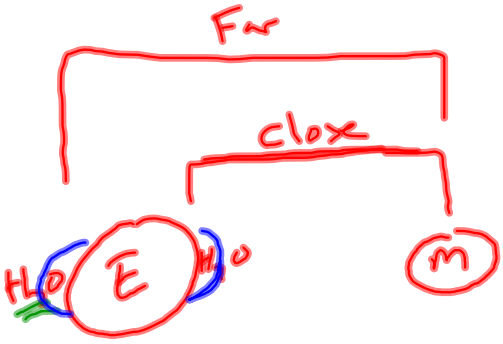
51)



$$F = \frac{G m_1 m_2}{r^2}$$

$F_{es} = 5.9 \times 10^{-3} N$ close side

$F_{fs} = 5.9 \times 10^{-3} N \rightarrow$ Far Side

$F_{cm} = 3.44 \times 10^{-5} N$

$F_{fm} = 3.22 \times 10^{-5} N$

close side

Far side

52) $M_s = ?$

$R_E =$

$T_E =$

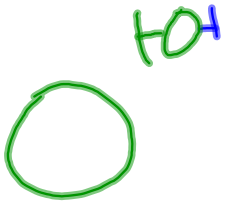
$G = 6.67 \times 10^{-11}$

$M_s = \frac{R^2}{G}$

$T^2 = \frac{4\pi^2 r^3}{G M_s}$ ← (1.5×10^{11})

(3.1×10^7) 6.67×10^{-11}

53)



$T = 86400 sec$

$G =$

$M_E = 5.98 \times 10^{24} kg$

$r = 4.2 \times 10^{7} m$

$$r^3 = \frac{G M_E T^2}{4\pi^2}$$

54) $3.84 \times 10^8\ m = R_{mE}$

$$F_{E\text{-}m} = \frac{G m_E m_m}{(R_{me})^2}$$

$G = 6.67 \times 10^{-11}$, $m_E = 5.98 \times 10^{24}$, $m_m \rightarrow 7.4 \times 10^{22}$

$$V = \sqrt{\frac{G M_E}{r}}$$

55) $700N = W_E$

$? = W_m$

$m_m = .107 m_E$

$R_m = .530 R_E$

$$g = \frac{G(.107 m_E)}{(.53 R_E)^2} = 3.7 \, m/s^2$$

$700N = m(9.81)$

$71kg(3.7 \, m/s^2) = 267N$

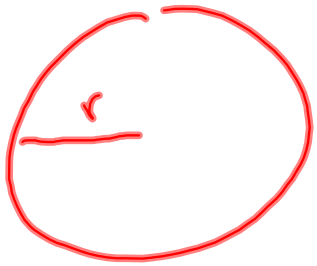
63) $T = 3.3\,yrs$

$$\frac{(3.3\,yrs)^2}{(1\,yr)^2} = \frac{r^3}{(1\,AU)^3}$$

$$r = 2.1\,AU$$

64) $r = 4.5\,m$

$\omega = ?$



$F_c = m\omega^2 r$

$F_g = mg$

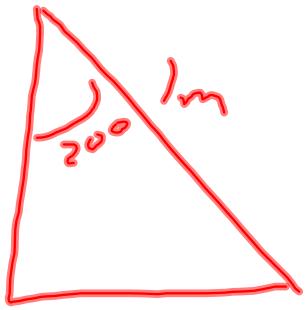
$m\omega^2 r = mg$

$\omega^2 r = g$

$\omega^2 = \frac{g}{r}$ $\omega = 1.47 \frac{rad}{sec}$

$\omega = 2\pi f$ $\frac{1.47}{2\pi} = 0.23\,Hz$

70)



$\sin(20) = \frac{r}{1m}$

$0.34m$

$$\tan\theta = \frac{v^2}{rg}$$

$$\tan(20) = \frac{v^2}{0.34(9.81)} = 1.1\ m/s$$

#8 $$V = \sqrt{\frac{6.67\times10^{-11}(8.5\times10^{23})}{3.5\times10^{6}}}$$

$$4024\ m/s$$

b) $$T^2 = \frac{4\pi^2(3.5\times10^{6})^3}{6.67\times10^{-11}(8.5\times10^{23})}$$

$$T = 5463\ sec$$

C $T^2 = \frac{4\pi^2 r^3}{G M_u}$ 1.9×10^7 sec

$T^2 = \frac{4\pi^2 (3.8 \times 10^9)^3}{6.67 \times 10^{-11} (8.68 \times 10^{25} kg)}$

D $\frac{4\pi^2 (2.8 \times 10^{12})^3}{2 \times 10^{30} G} = 2.6 \times 10^9 N$

e) $\frac{G(100{,}000)(8.6 \times 10^{25})}{[(3.8 \times 10^8) + 2.35 \times 10^7)]^2} = 40N$

f) $g = \frac{GM}{r^2}$

$$\frac{6.67\times10^{-11}(8.68\times10^{25}\,kg)}{(2.35\times10^{7}\,m)^2}$$

$10.48\ m/s^2$

g) $F = \frac{6.67\times10^{-11}(8.68\times10^{25})(1.99\times10^{30}\,kg)}{(2.87\times10^{12}\,m)^2}$

$1.4\times10^{21}\ N$

h) $\frac{2.87\times10^{12}}{1.5\times10^{11}\,m} =$ 19.1 AU

#9 Change 2.51 to 4.51m

mass is 3kg

$C = 2\pi r$

a) $r = \frac{4.51}{2\pi} = 0.71m$

b) $\frac{10^{sec}}{4 rev} = 2.5 sec$

c) $\frac{4.51}{2.5} = 1.8 m/s$

d) $a_c = \frac{(1.8)^2}{0.71m} = 4.56 m/s^2$

e) center

f) $F = ma_c$ $F = 3kg(4.56 m/s^2)$

$13.7N$