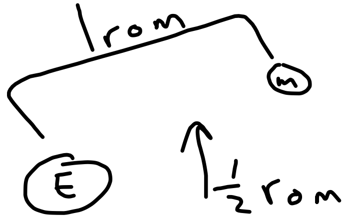
$$\frac{R_1^3}{T_1^2} = \frac{R_2^3}{T_2^2}$$



$\uparrow \frac{1}{2}$ rom

$\frac{1}{2}$ way between earth/moon

$T_2 = ?$

$$\frac{(1\,\text{rom})^3}{(27.3\,\text{da})^2} = \frac{(.5\,\text{rom})^3}{T_2^2}$$

$$T_2 = \sqrt{\frac{(.5\,\text{rom})^3(27.3\,\text{da})^2}{(1\,\text{rom})^3}} = \underline{\underline{9.7\,\text{da}}}$$

$8.4\times10^5\,\text{s}$

dist. to moon

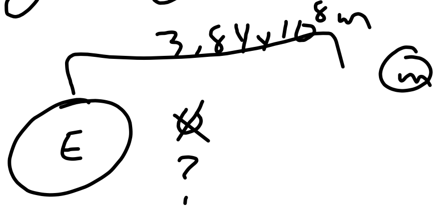
$\frac{1}{2}$ dist to moon

$$\frac{(3.84\times10^8\,\text{m})^3}{(2.36\times10^6\,\text{s})^2} = \frac{(1.92\times10^8\,\text{m})^3}{T_2^2}$$

$T_2 = 8.34\times10^5\,\text{s}$

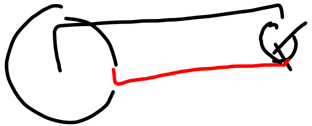
Title: Jan 24-7:47 AM (1 of 6)

Where do you put a satellite to have a geosynchronous orbit.



$$\frac{r_m^3}{T_m^2} = \frac{r_s^3}{T_s^2} \qquad \frac{(3{,}84\times10^8\ m)^3}{(27{,}3\ da)^2} = \frac{r_s^2}{(1\ da)^2}$$

$r_s = 4{,}23\times10^7\ m$



from surface?

$$\begin{array}{lr} & 4{,}23\times10^7\ m \\ - & .638\times10^7\ m \quad r_e \\ \hline & 3.592\times10^7\ m \end{array}$$

$$F = \frac{G\,m_{\overset{\text{Superior}}{\downarrow}1}\,m_2^{\leftarrow\text{Inferior}}}{r^2}$$

$$m_2 a_c = F_c$$

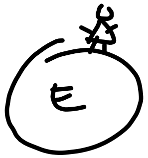
$$\frac{m_2 v^2}{r} = F_c$$

$$\frac{m_2 4\pi^2 r}{T^2} = F_c$$

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

$$m_2 a_c = F_c$$

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



$$a_c = \frac{G m_1}{r^2}$$

What's the centripetal acceleration on the earth?

$$a_c = \frac{6.67 \times 10^{-11}\,N m^2/kg^2 \,(5.98 \times 10^{24}\,kg)}{(6.38 \times 10^{6}\,m)^2}$$

$$a_c = 9.8\,m/s^2$$

...on the moon?

mass of moon

$g =$

$$g_m = \frac{G(7.2 \times 10^{22}\,kg)}{(1.785_{r_m} \times 10^{6}\,m)^2}$$

$$g_m = 1.5\,m/s^2$$

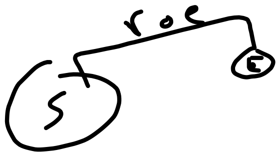
$$F = \frac{G m_1 m_2}{r^2}$$

$$\frac{m_2 v^2}{r} = F_c$$

$$\frac{\cancel{m_2}\, v^2}{\cancel{r}} = \frac{G m_1 \cancel{m_2}}{r^{\cancel{2}}}$$

$$v = \sqrt{\frac{G m_1}{r}}$$

What velocity does the earth circle the sun at?



$$v_e = \sqrt{\frac{G\left(\overset{\text{mass of sun}}{\overset{\downarrow}{1{,}99\times10^{30}\,kg}}\right)}{\underset{r_{oe}}{1{,}5\times10^{11}\,m}}}$$

$$v_e = 29{,}700\ m/s$$

$$2{,}97\times10^{4}\ m/s$$

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

$$\frac{m_2 4\pi^2 r}{T^2} = F_c$$

$$\frac{\cancel{m_2} 4\pi^2 r}{T^2} = \frac{G m_1 \cancel{m_2}}{r^2}$$

Newton's variation of Kepler's 3rd Law

$$\frac{r^3}{T^2} = \frac{G m_1}{4\pi^2}$$

$$\frac{r^3}{T^2} = K$$