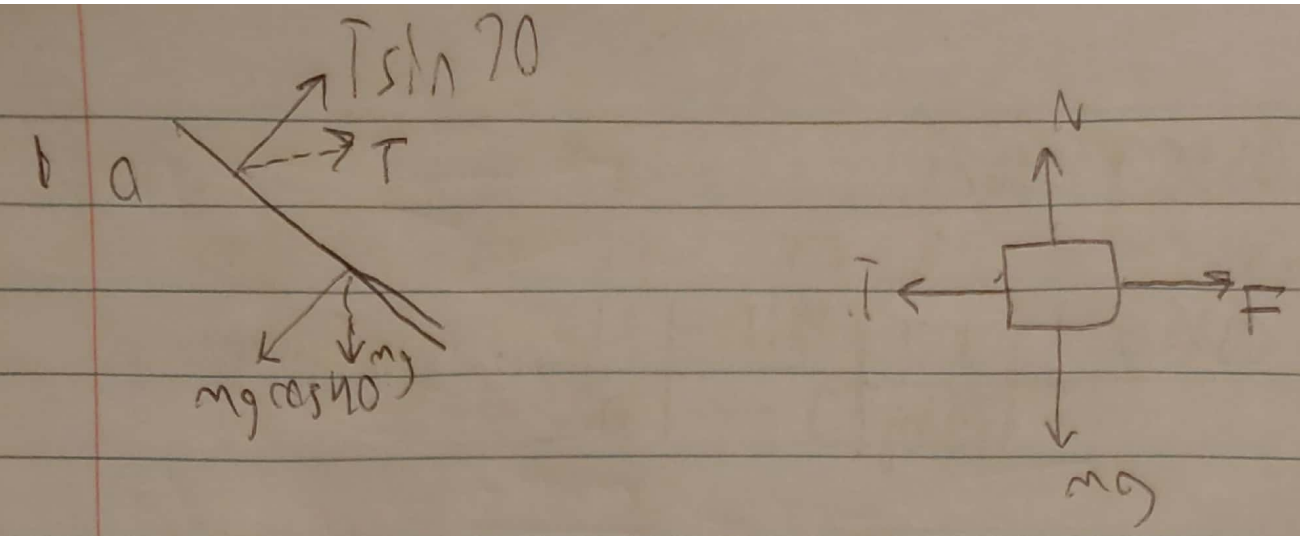


b. $M_H = 0$ thus $T\sin 70 \cdot r - mg\cos 40 \cdot b = 0$

$T\sin 70 \cdot 10 = 2100 \cdot 9.81 \cos 40 \cdot 6$

$T = 10076.45\,N$

c. $T = \mu_s \cdot Mg \rightarrow M = \frac{T}{\mu_s g}$

$M = \frac{10076.45}{0.4 \cdot 9.81} \rightarrow M = 2567.90\,kg$

2 part H

$$a = \frac{-6.67430E{-}11 \cdot 7.35E22 \cdot 200}{E}$$

$E = -\frac{GMm}{2E} \rightarrow E = 0.5(200)(1600)(2) + (2.86 \cdot 10^{10})$

$a = 1.84 \cdot 10^{6}\,m$

2) a) $g_{moon} = \frac{G m_{moon}}{r^2} \rightarrow \frac{6.67430 \cdot 10^{-11} \cdot 7.35 \cdot 10^{22}}{(1.74 \cdot 10^6)^2}$

$G_{moon} = 1.625 \ m/s^2$

b) $V_{esc} = \sqrt{\frac{2Gm}{r}} \rightarrow \sqrt{\frac{2 \cdot 6.67430 \cdot 10^{-11} \cdot 7.35 \cdot 10^{22}}{1.74 \cdot 10^6}}$

$V_{esc} = 2380 \ m/s$

c) $V_{orb} = \sqrt{\frac{GMm}{r+h}} \rightarrow \sqrt{\frac{6.67430 \cdot 10^{-11} \cdot 7.35 \cdot 10^{22}}{1.74 \cdot 10^6 + 10^5}}$

$V_{orb} = 1681 \ m/s$

d) $U = \frac{-GM_m \cdot m_s}{R+h} \rightarrow \frac{-6.67430 \cdot 10^{-11} \cdot 7.35 \cdot 10^{22} \cdot 200}{1.74 \cdot 10^6 + 10^5}$

$PE_{sat} = 2.86 \cdot 10^{10} \ J$

e) $L = m_{sat} \cdot V_{orb} \cdot (r+h) \quad L = 200 \cdot 1681 \cdot (1.76 \cdot 10^6) \cdot 10^5$

$L = 6.38 \cdot 10^{11} \ kg m^2/s$

f) Small radial component means elliptical

g) Yes is constant due to conservation of angular momentum.

e) Small radial component Thus elliptical

g) Yes is constant due to conservation of angular momentum

h) $E = \frac{-G \cdot M_m \times M_s}{2a} \rightarrow E = 0.5 \cdot 200$

3) a $\frac{GM_E m}{x^2} = \frac{G(M_m)m}{L - x^2} \rightarrow \frac{5.97 \cdot 10^{24}}{x^2} = \frac{7.35 \cdot 10^{23}}{(3.844 \cdot 10^8 - x)^2}$

$x = 345743 \text{ km}$

b $\frac{6.67 \cdot 10^{-11}(5.97 \cdot 10^{24}}{(345743 \cdot 10^3)^2} - \frac{6.67 \cdot 10^{-11}(7.35 \cdot 10)^{22}}{(3.844 \cdot 10^8 - 345.743 \cdot 10^3)^2}$

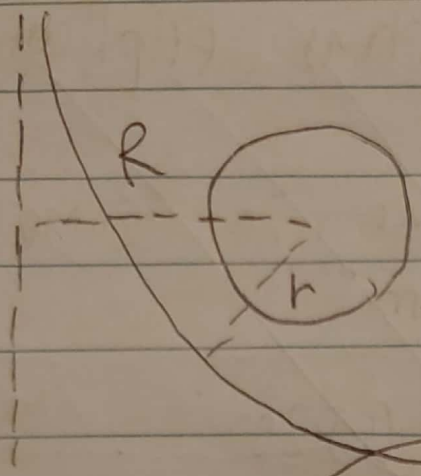
$\frac{5.8 \cdot 10^{-5}}{9.81} = \frac{1}{196000}$

196200 times greater

196200 times greater

5

a



b Asteroid $L_i = mv_i r$

Init Energy of System $E_i = \frac{1}{2}mv^2$

c $\frac{1}{2}mv_i^2 = \frac{1}{2}mv^2\left(\frac{r_1}{r}\right)^2 = \frac{GMm}{r}$

$$v_1 = \sqrt{\frac{2GMr}{(r_1^2 - r^2)}} \rightarrow \sqrt{\frac{2(6.67)\cdot 10^{-11}\cdot 1.9\cdot 10^{27}\cdot (8549\cdot 10^3)}{12500\cdot 10^3 - 8549\cdot 10^3}}$$

$51044\ m/s \rightarrow 51.0\ km/s$

d. As the asteroid has KE but no PE it cannot be in a closed orbit.

8) $\omega = \frac{1}{2}\sqrt{\frac{6m}{B^3}} \rightarrow \frac{1}{2}\sqrt{\frac{6 \cdot 6.62 \cdot 10^{-11} \cdot 3 \cdot 10^{30}}{10^{18}}}$

$\omega = 2.2 \cdot 10^{-7}$ rad/s

$T = \frac{2\pi}{\omega} = \frac{2\pi}{2.2 \cdot 10^{-7}} = T = 2.8 \cdot 10^{7}$ sec