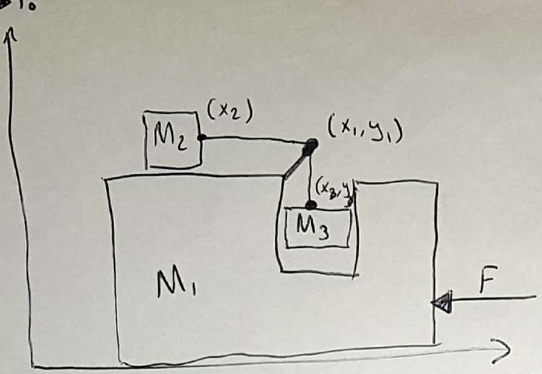
$g = 10$, $V_0 = 0 \rightarrow t_0$

Object $M_1 M_2 M_3$



~~B~~ user given:

$\mu_1\ \mu_2\ \mu_3$: friction

$m_1\ m_2\ m_3$: mass

F : given force

$t_1, t_2, t_3, \ldots t_n$: given times

$f_1, f_2, f_3, \ldots f_n$: forces changing given

$T_1, T_2, T_3, \ldots T_n$: Times that forces change

$X_{10}, Y_{10}, X_{20}, X_{30}, Y_{30}$

set limits : (for user input) X_{20} ~~≠~~ X_{10}

Y_{30} ~~≠~~ Y_{10}

Forces on $M_1 \Rightarrow F = ma(\mu_1)$

$\Rightarrow F = (m_1 + m_2 + m_3)\, a_1 (\mu_1)$

acc of $M_1 \Rightarrow a_1 = \dfrac{F}{(m_1 + m_2 + m_3)(\mu_1)}$

distance of M_1 at t_0 $\Rightarrow d = V_0 t + \frac{1}{2} a (t)^2$ ($V_0 = 0$ and $t_0 = 0$)

at $t_1, t_2, t_3 \ldots$ (for example) $\Rightarrow d = 0(t_1) + \frac{1}{2} a_1 (t_1)$

$\Rightarrow d = \frac{1}{2} a_1 (t_1) = D_0$

now we need V_1 then V_2 and so on so:

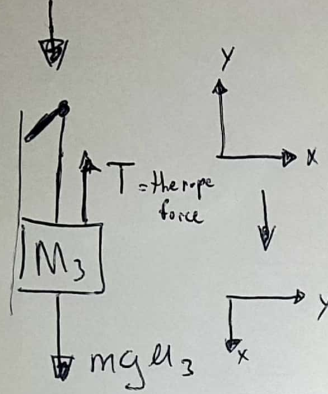
$V_{1,2,3\ldots} \Rightarrow$ at t_0 we know $V_0 = 0$

to get $V_1, \ldots V_n$ we need to find the distance it traveled before the Force changed:

$d = V_{(n-1)} (T_n) + \frac{1}{2} a_n (T_n)^2$

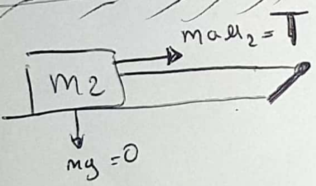
$\rightarrow V_n = \dfrac{d}{T_{n+1}} - ((1/2)(a_2)(T_{n+1})$ → from this we get: next distances at need times ; now $\Rightarrow$ to get V_n at T_n ; $d = V_n T_{n+1} + \frac{1}{2} a_2 (T_{n+1})^2$

Forces of M_3 $\Longrightarrow$ explained



~~net force = $T - mga_3$~~ $\longrightarrow$ old solution check end of Page 4

~~net force = $mga_3 - T$~~ ① ~~now what is T?~~



~~Σx net force = $T - mg = T = ma_2$~~ ②

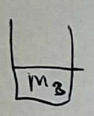
~~① ② $\Longrightarrow$ net force of $M_3 = m_3 g a_3 + m_2 a_2$~~ $\Longrightarrow$ we should know for a fact that acceleration of a_2 and a_3 are equal

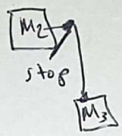
~~Σx $a_2 = a_3$ $\xrightarrow{\text{toget}}$ $a_2 = a_3 = \dfrac{a_2 m_2 g}{(a_1 m_1) + (a_2 m_2)}$~~ $\Rightarrow$ the effecting force changes on M_1 does not effect M_2 and M_3 so we don't need to find velocity we can use V_0 only to get displacement of M_2 and M_3 which will always be $d_2 = d_3$ but at t_n given;

$$d = (V_0 \cdot t_n) + \frac{1}{2}(t_n)^2 a_{23} = \frac{1}{2}(t_n)^2 a_{23}$$

---

now M_{23} can't escape the hole and M_2 can't fall from hole so we need to set limit by





finding the length of the rope:

R_H = $rope_{horizontal}$ = $X_{1_0} - X_{2_0}$ → needed ⟹ displacement of M_3 at max is = $rope_H$ (distance)

and ⟹ displacement of M_2 at max is = $rope_H$

R_V = rope vertical = $Y_{1_0} - Y_{3_0}$

R_L = Rope length = $R_H + R_V$ → no need

~~#~~

the final position of x_2:

$X_2 \leq X_1$ or $X_2 \leq X_3$

same

final needed answers:

X_1 Position at t_n = $X_1 - \left(\underline{\text{displacement of } M_1 \text{ at } t_n}\right)$
or distance

X_2 Position at t_n = $X_2 + \left(\text{displacement of } M_2 \text{ at } \underline{t_n}\right) - \left(\text{displacement of } M_1 \text{ at } \underline{t_n}\right)$

X_3 Position at t_n = X_1 position at t_n

Y_3 Positiont at t_n = $Y_3 - \left(\text{displacement of } M_3 \text{ at } \underline{t_n}\right)$

We know $a_2 = a_3$ to get it: $(m_3 g - \mu_3 m_3 g) - m_2 a_2 - \mu_2 m_2 g = m_{Net} a_2$

$\Rightarrow$ $m_3 g - \mu m_3 g - \mu_2 m_2 g = (m_2 + m_3) a_2 +$

$\Rightarrow + m_2 a_2 \Rightarrow$ $g(m_3 - \mu m_3 - \mu_2 m_2) = (a_2)((m_2 + m_3) + m_2)$

$$\Rightarrow \frac{g(m_3 - \mu m_3 - \mu_2 m_2)}{(m_2 + m_3) + m_2} = a_2 \quad //$$