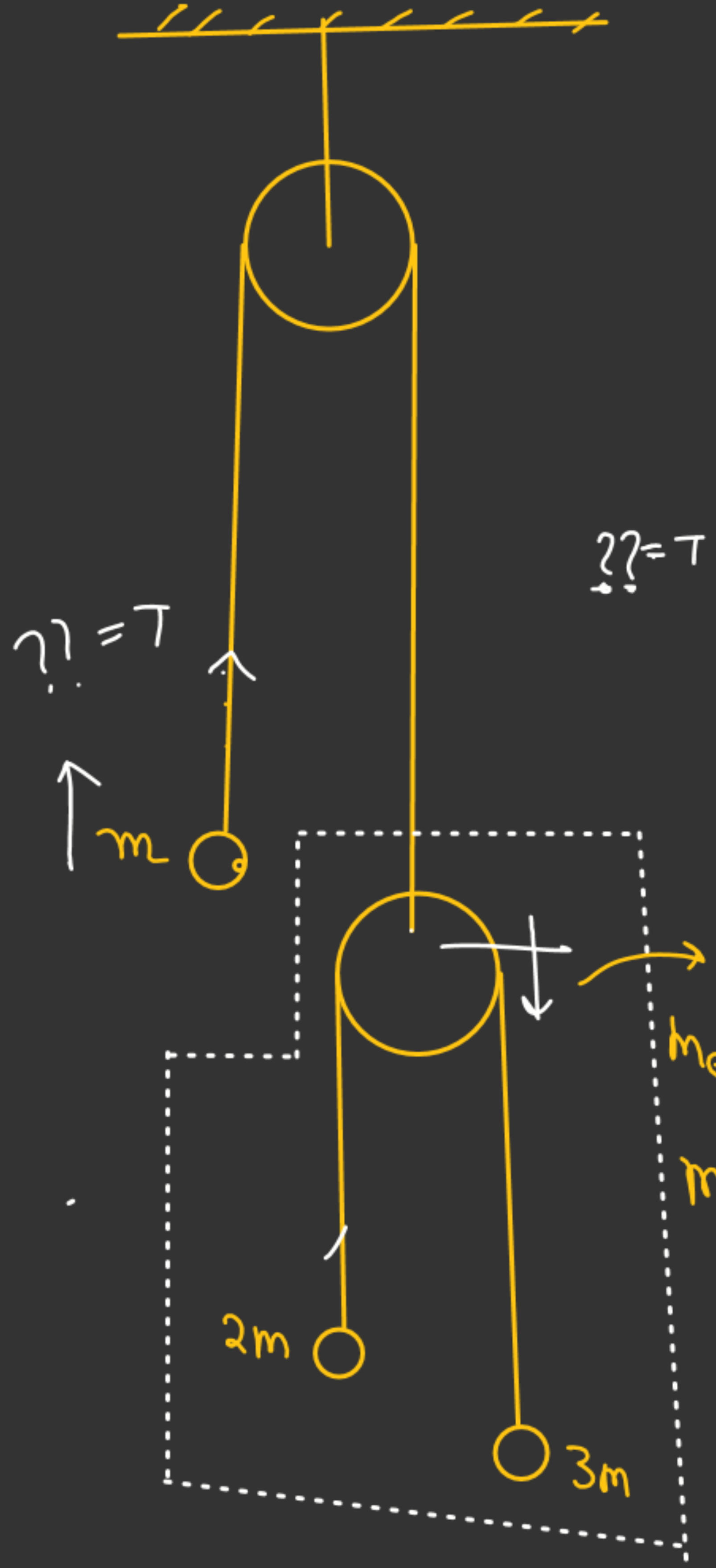
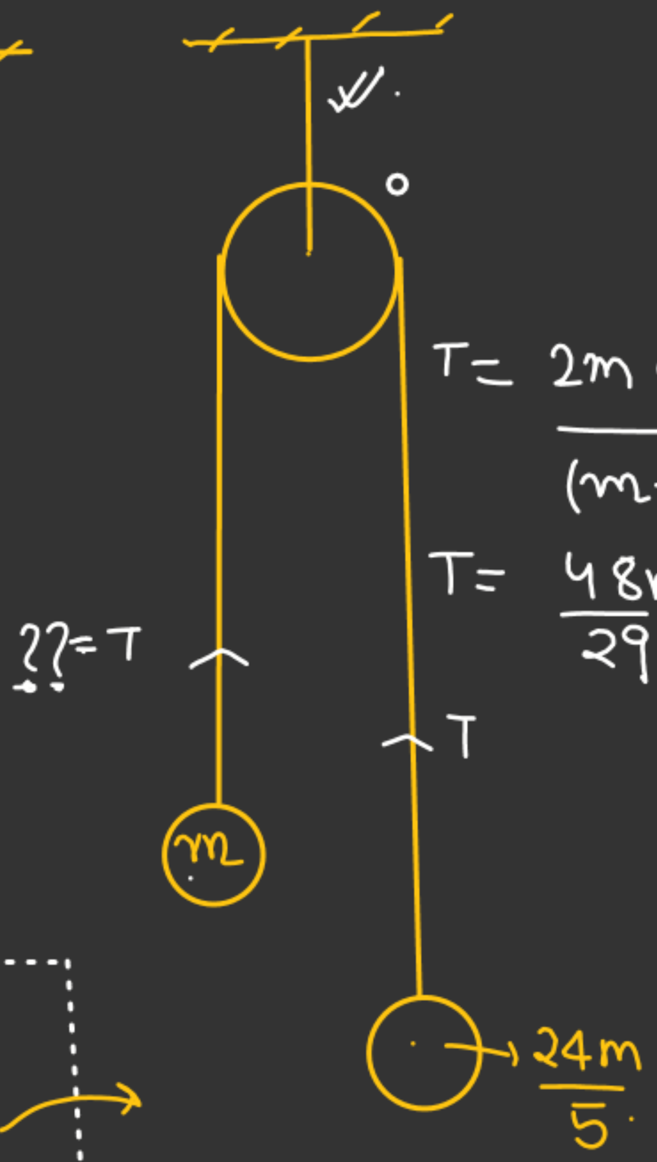
Nishant Jindal



$$m_{eq} = \frac{4 \times 2m \times 3m}{5m}$$

$$m_{eq} = \frac{24m}{5}$$

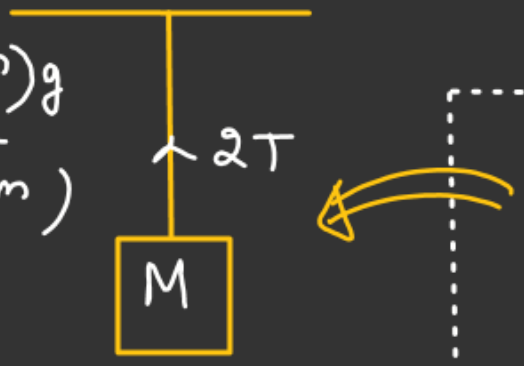


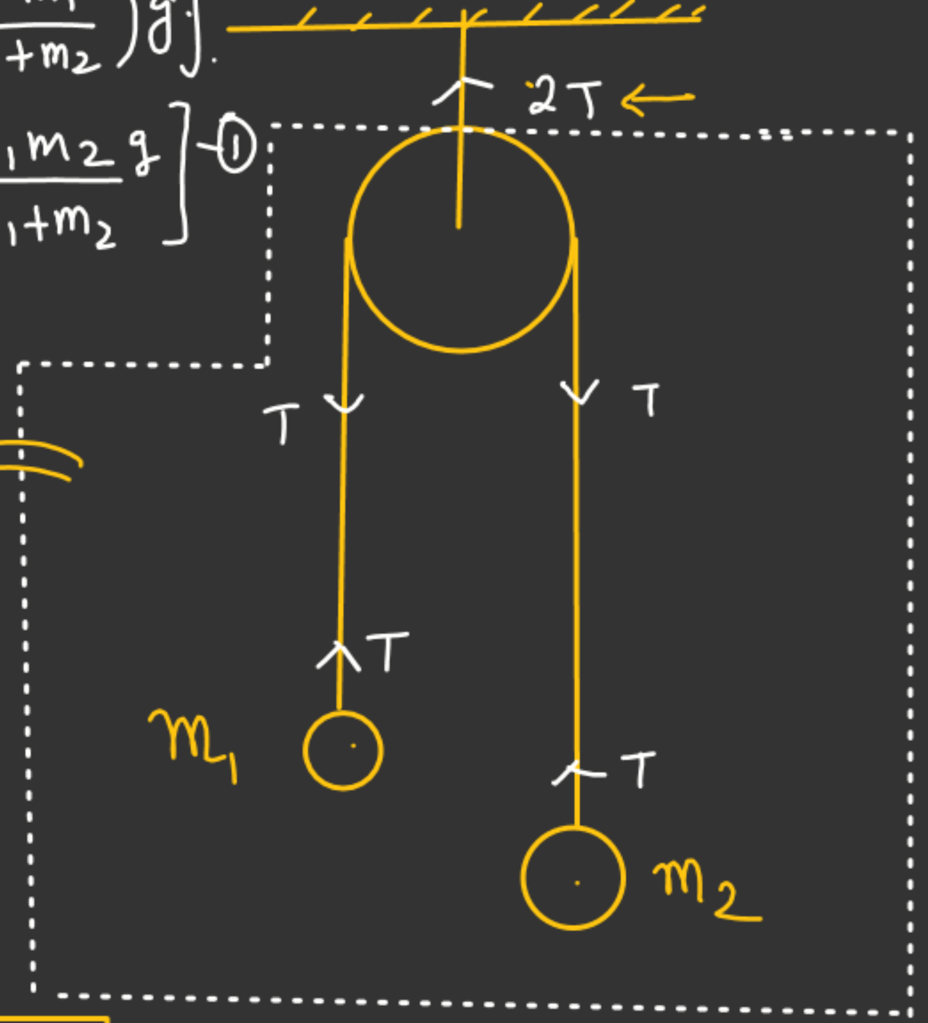
$$T = \frac{2m\left(\frac{24m}{5}\right)g}{\left(m + \frac{24m}{5}\right)}$$

$$T = \frac{48mg}{29}$$

$$\left[a = \left(\frac{m_2 - m_1}{m_1 + m_2}\right)g\right]$$

$$T = \left[\frac{2m_1 m_2 g}{m_1 + m_2}\right] \quad \text{—(i)}$$





$$2T = Mg \quad \text{—(ii)}$$

$$\frac{4 m_1 m_2 \cancel{g}}{m_1 + m_2} = M\cancel{g}$$

$$\boxed{M = \frac{4 m_1 m_2}{m_1 + m_2}}$$

Equivalent mass, which should be replaced by atwood Machine set-up.

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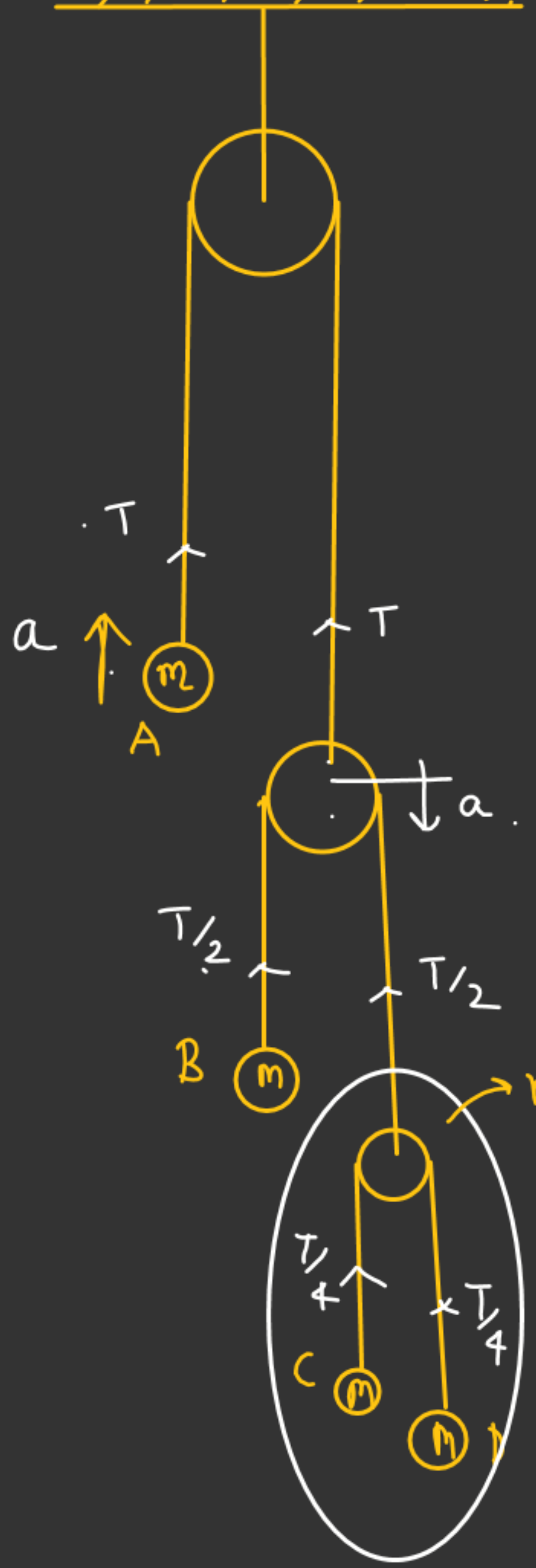
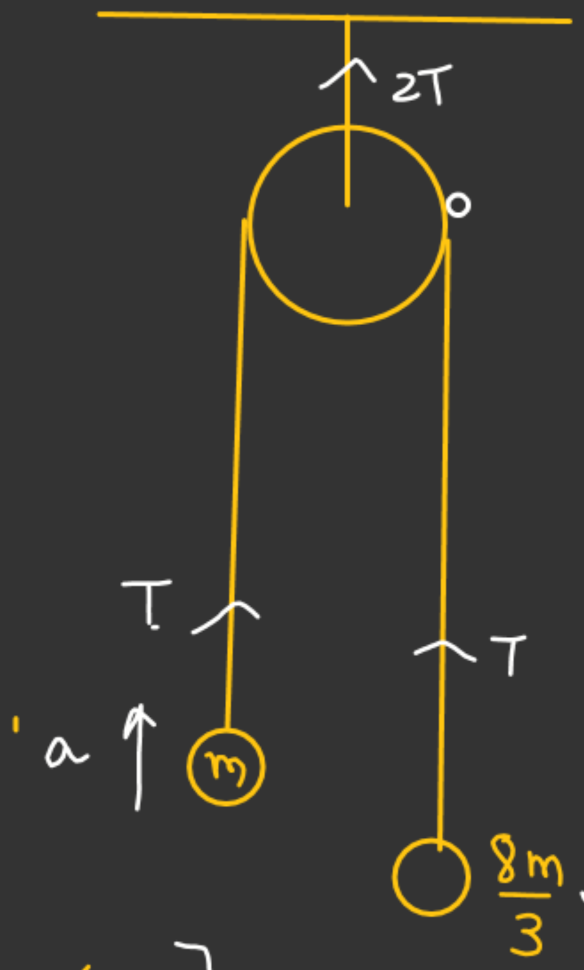


$$m_{eq} = \frac{4m^2}{2m}$$
$$= 2m$$

$$m_{eq} = \left[\frac{4m(2m)}{m+2m}\right]$$
$$= \frac{8m}{3}.$$



$$a = \left[\frac{\frac{8m}{3} - m}{\frac{8m}{3} + m}\right] g$$

$$a = \left(\frac{5g}{11}\right)$$

$$T = \frac{2m\left(\frac{8m}{3}\right)g}{\left(m + \frac{8m}{3}\right)}$$

$$T = \left(\frac{16mg}{11}\right)$$

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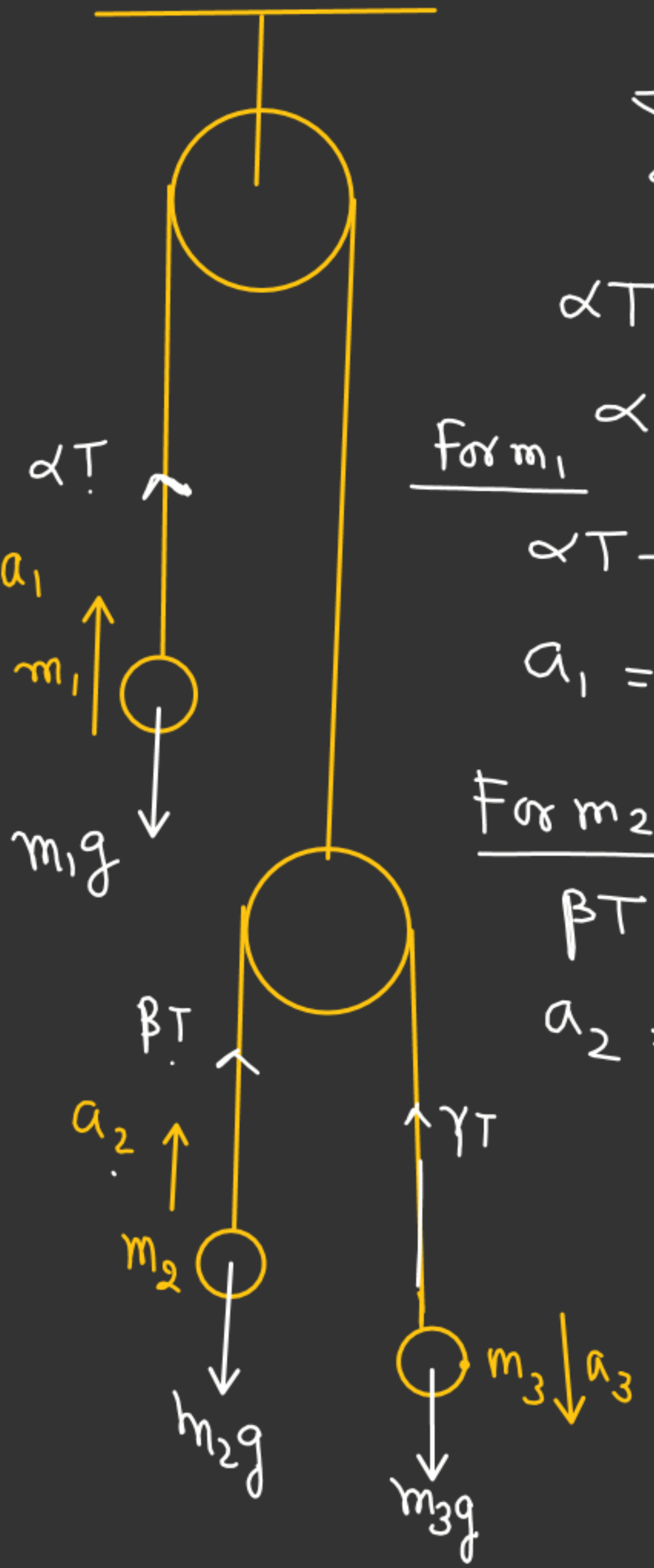

$$\sum \vec{T}\cdot\vec{a} = 0$$

$$\alpha T\cdot a_1 + \beta T a_2 - \gamma T a_3 = 0$$

$$\alpha a_1 + \beta a_2 - \gamma a_3 = 0 \quad -(1)$$

For m_1

$$\alpha T - m_1 g = m_1 a_1$$

$$a_1 = \left[\frac{\alpha T}{m_1} - g\right] \checkmark$$

For m_2

$$\beta T - m_2 g = m_2 a_2$$

$$a_2 = \left(\frac{\beta T}{m_2} - g\right) \checkmark$$

For m_3

$$m_3 g - \gamma T = m_3 a_3$$

$$a_3 = \left(g - \frac{\gamma T}{m_3}\right) \checkmark$$

Put value of a_1, a_2 & a_3 in Eq^n (1).

$$\alpha\left[\frac{\alpha T}{m_1} - g\right] + \beta\left[\frac{\beta T}{m_2} - g\right] - \gamma\left[g - \frac{\gamma T}{m_3}\right] = 0$$

$$\left[\frac{\alpha^2}{m_1} + \frac{\beta^2}{m_2} + \frac{\gamma^2}{m_3}\right]T = (\alpha+\beta+\gamma)g$$

$$\boxed{T = \frac{(\alpha+\beta+\gamma)g}{\frac{\alpha^2}{m_1} + \frac{\beta^2}{m_2} + \frac{\gamma^2}{m_3}}}$$

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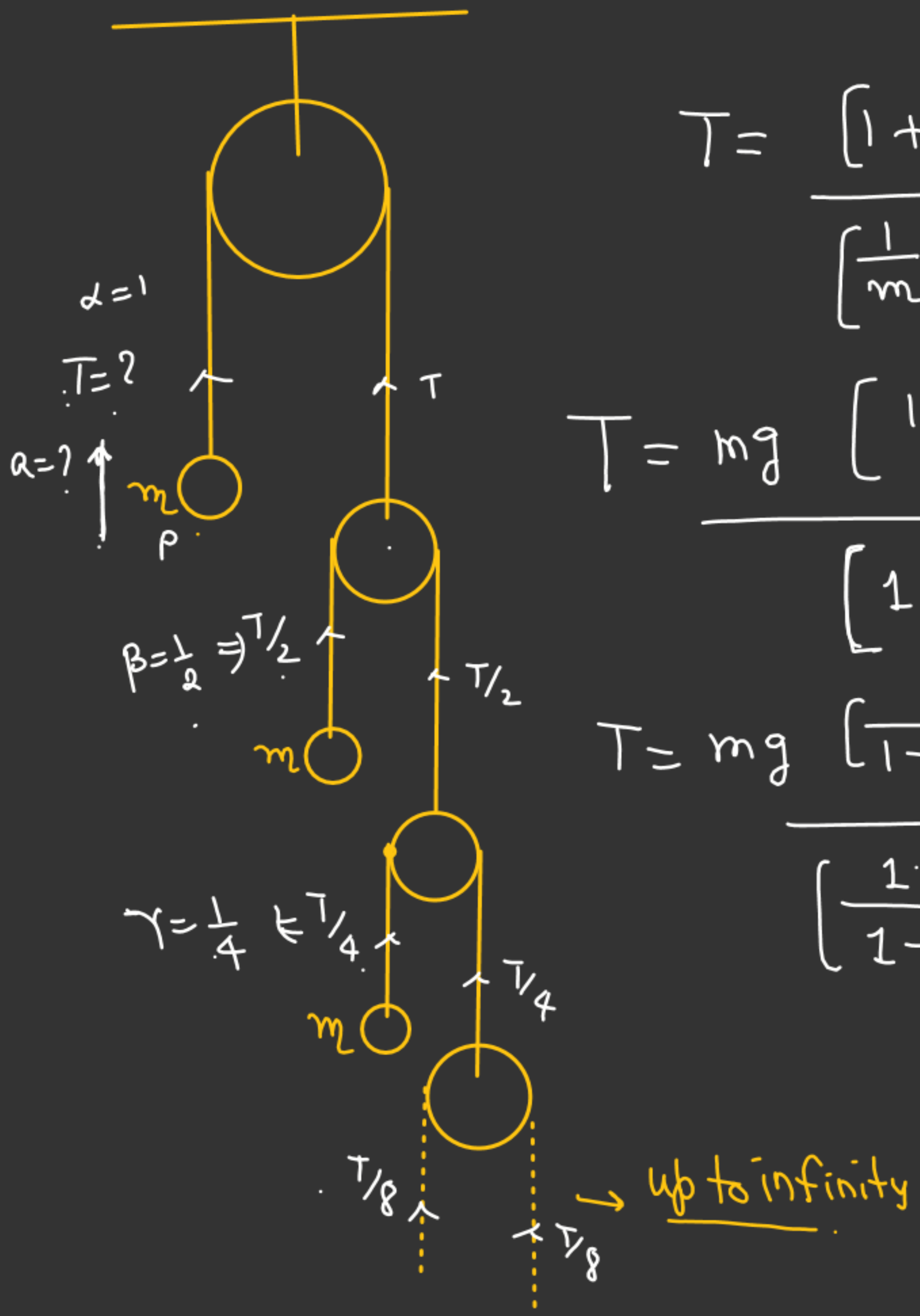
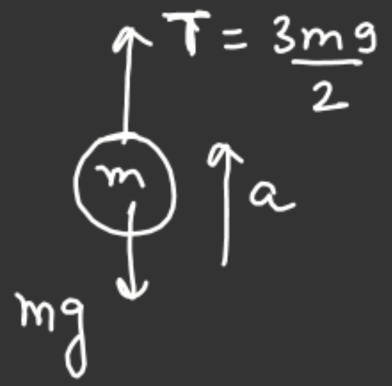


$$T = \frac{\left[1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} \cdots \infty\right] g}{\left[\frac{1}{m} + \left(\frac{1}{2}\right)^2 \frac{1}{m} + \left(\frac{1}{4}\right)^2 \frac{1}{m} \cdots \infty\right]}$$

$$T = \frac{(\alpha + \beta + \gamma \cdots) g}{\left[\frac{\alpha^2}{m_1} + \frac{\beta^2}{m_2} + \frac{\gamma^2}{m_3} \cdots\right]} \checkmark$$

$$T = mg \frac{\left[1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} \cdots \infty\right]}{\left[1 + \left(\frac{1}{2}\right)^2 + \left(\frac{1}{2}\right)^4 + \left(\frac{1}{2}\right)^6 \cdots \infty\right]}$$

$$T = mg \frac{\left[\frac{1}{1 - 1/2}\right]}{\left[\frac{1}{1 - \left(\frac{1}{2}\right)^2}\right]} \Rightarrow T = \frac{2mg}{\left(\frac{4}{3}\right)} = \frac{3mg}{2}$$



$$\frac{3mg}{2} - mg = ma$$

$$\boxed{a = g/2}$$

Angular velocity b/w two particles.

$\boxed{S = R\theta}$

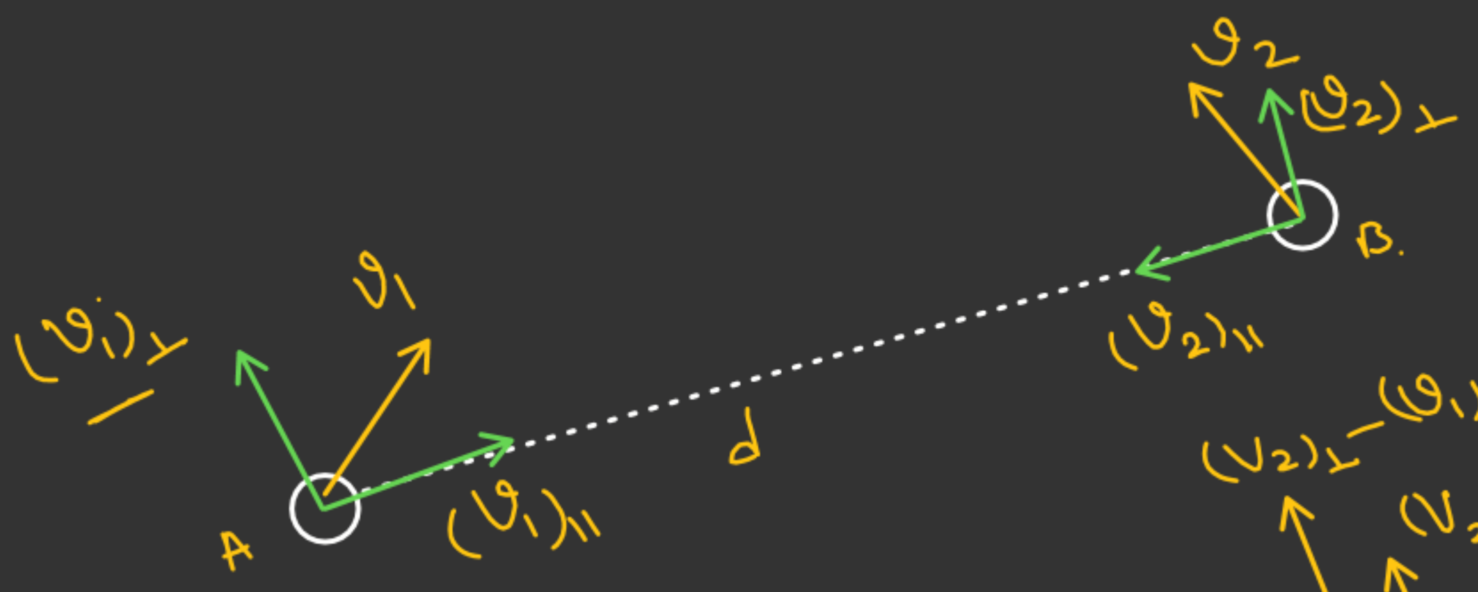
$\boxed{v = R\omega}$

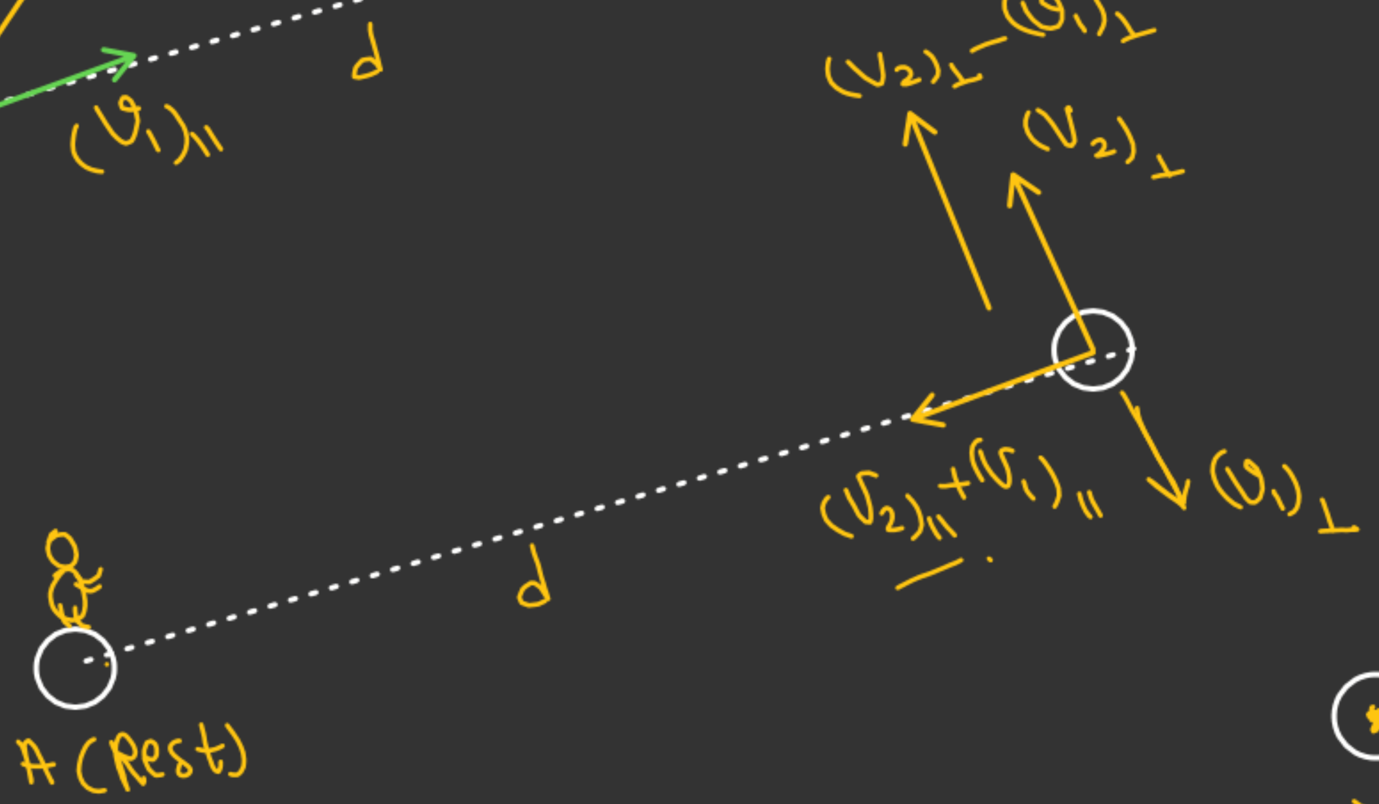
$\frac{dx}{dt} = v$

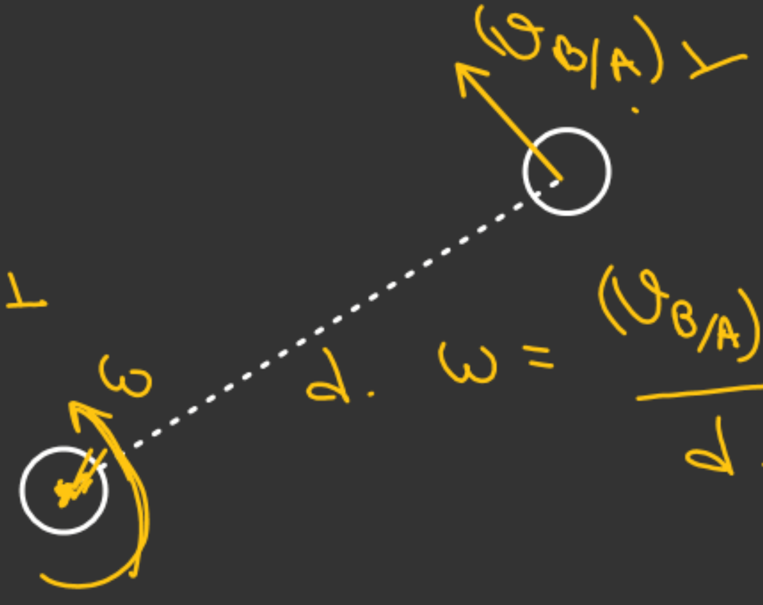
$\left(\frac{d\theta}{dt}\right) = \omega$

$\Downarrow$ Rate of Change of angular displacement

$\Downarrow$ (Angular velocity)







$\omega = \frac{(v_{B/A})_\perp}{d}$

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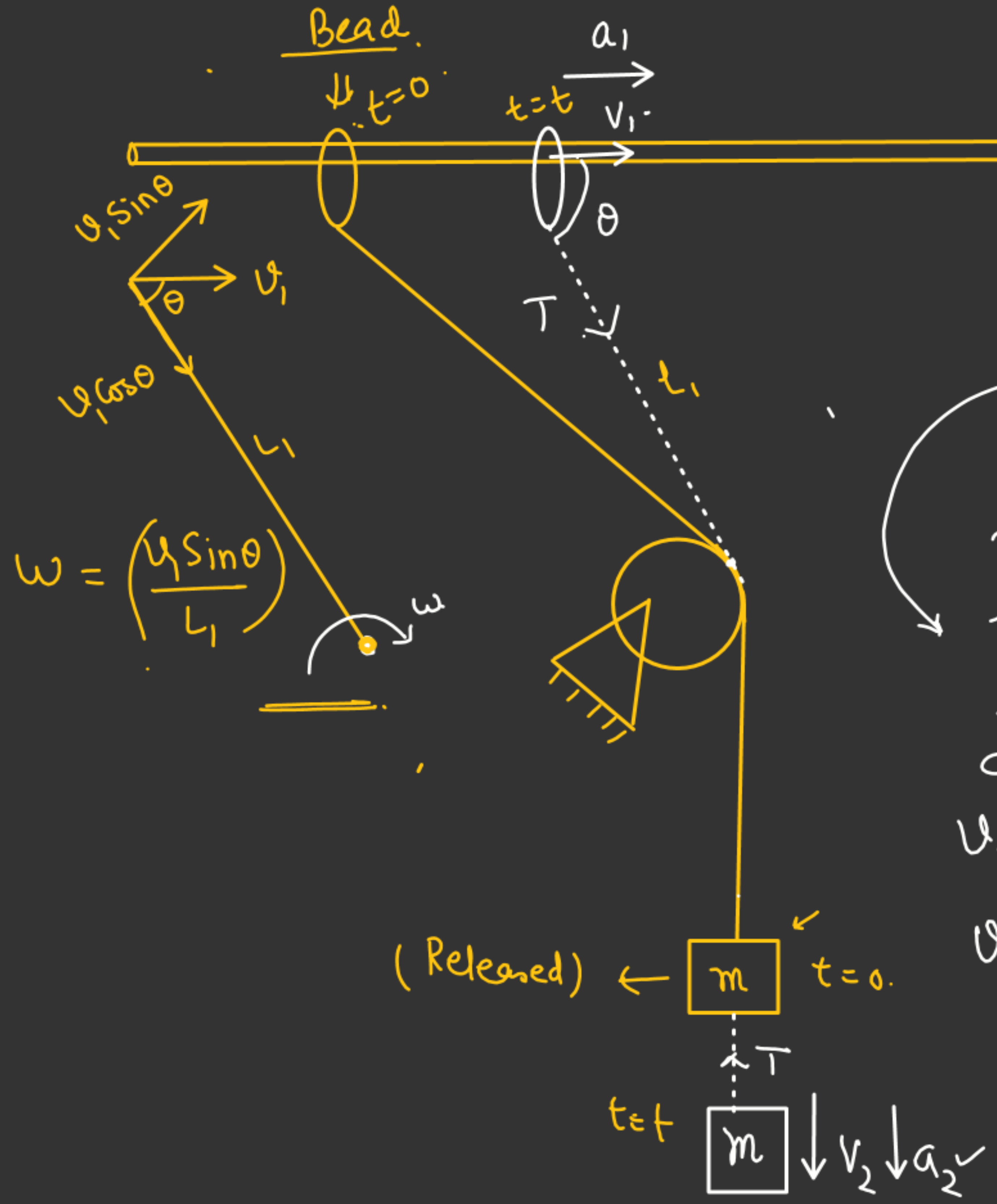
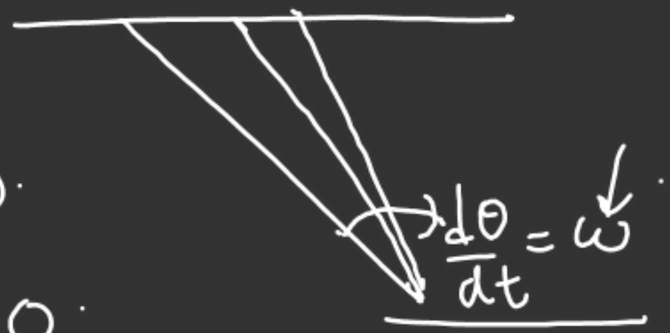


$y=f(x)$

$\frac{dy}{dt} \to \left(\frac{dy}{dx}\times\frac{dx}{dt}\right)$



$\sum \vec{T}\cdot\vec{V} = 0$

$TV_1\cos\theta - TV_2 = 0$

$\boxed{V_1\cos\theta = V_2}$

$\Rightarrow \boxed{a_1\cos\theta = a_2 \quad \times} \Rightarrow$ θ → Changing

Differentiating both Side w.r.t time

$\sum \vec{T}\cdot\vec{a} \Rightarrow$ Not aplicable

$\frac{d}{dt}[v_1\cos\theta] = \left(\frac{dv_2}{dt}\right)$

$v_1 \frac{d(\cos\theta)}{dt} + \cos\theta\cdot\left(\frac{dv_1}{dt}\right) = a_2$

$v_1\left[\frac{d}{d\theta}(\cos\theta)\left(\frac{d\theta}{dt}\right) + (\cos\theta)a_1\right] = a_2$

$v_1[-(\sin\theta)\omega] + a_1\cos\theta = a_2$

$a_2 = a_1\cos\theta - v_1\omega\sin\theta$

$a_2 = \left(a_1\cos\theta - \frac{v_1^2\sin^2\theta}{L_1}\right)$

if $v_1 = 0$. i.e at initial Condition

$a_2 = a_1\cos\theta \; [t=0]$