Mecanica
Pauta C1 2010

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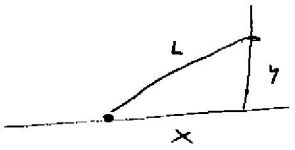
P1)

a)

$$x^2 + y^2 = L^2 \Rightarrow y = \sqrt{L^2 - x^2}$$



$$\Rightarrow x\dot{x} = -y\dot{y} = -y v_0 \quad \wedge \quad \dot{x}^2 + x\ddot{x} = -v_0^2$$

$$\Rightarrow \dot{x} = -\sqrt{\left(\frac{L}{x}\right)^2 - 1}\, v_0 \Rightarrow \boxed{v = v_0\sqrt{\left(\frac{L}{x}\right)^2 - 1}} \quad 1.5 \text{ Pt}$$

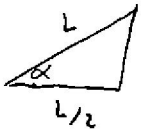
$$\Rightarrow \ddot{x} = \frac{(-v_0^2 - \dot{x}^2)}{x} = v_0^2\left(-1 - \left(\frac{L^2}{x^2} - 1\right)\right)$$

$$\Rightarrow \frac{v_0^2}{x}\left(-\frac{L^2}{x^2}\right) \Rightarrow \boxed{a = \frac{v_0^2 L^2}{x^3}} \quad 1.5 \text{ Pt}$$

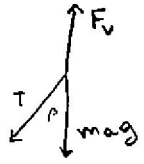
b)

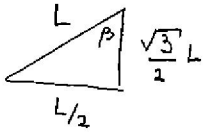
m_b : 

$$T\cos\alpha = m_b a$$



$$\frac{T}{2} = m_b \frac{v_0^2 L^2}{\left(\frac{L}{2}\right)^3} \Rightarrow \boxed{T = \frac{16\, m_b v_0^2}{L}} \quad 1.5 \text{ Pt}$$

m_a : 



$$-T\cos\beta - m_a g + F_v = 0$$

$$F_v = m_a g + \frac{\sqrt{3}}{2} \cdot \frac{16\, m_b v_0^2}{L}$$

$$\boxed{F_v = m_a g + \frac{\sqrt{3}\ 8\, m_b v_0^2}{L}} \quad 1.5 \text{ Pt}$$