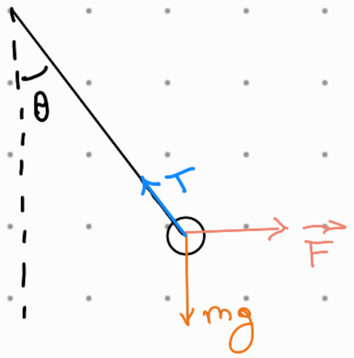
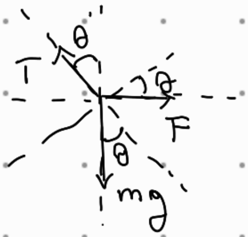
Provinha 5

① (a)



(b) Como temos eq. durante o mov. vale $\vec{a}=0$, logo



$$\Rightarrow \begin{cases} T\cos\theta = mg \\ T\sin\theta = F \end{cases}$$

$\Rightarrow \boxed{T = \frac{mg}{\cos\theta}}$ e $\boxed{F = mg\tan\theta}$

(c) Note que $\vec{T}\cdot d\vec{l} = 0$ já que $\vec{T}\propto\hat{r}$ e $d\vec{l}\propto\hat{\theta}$, logo $\boxed{W_T=0}$, para $\vec{F}$, temos

$$W_F = \int_0^\alpha \vec{F}\cdot d\vec{l} = \int_0^\alpha \vec{F}\cdot\hat{\theta}\, l\, d\theta = \int_0^\alpha F\, l\cos\theta\, d\theta = \int_0^\alpha mgl\sin\theta\, d\theta$$

$$= mgl(-\cos\theta)\Big|_0^\alpha = mgl(1-\cos\alpha) \therefore \boxed{W_F = mgl(1-\cos\alpha)}$$

Para a força peso temos que $F_R=0$ já que temos eq. logo $W_{Total}=0 \therefore W_P = -W_F$, de forma mais explícita

$$W_P = \int_0^\alpha m\vec{g}\cdot d\vec{l} = \int_0^\alpha mg(-\sin\theta)\, l\, d\theta = -\int_0^\alpha mg\sin\theta\, l\, d\theta \Rightarrow \boxed{W_P = -mgl(1-\cos\alpha)}$$

(d) Por conservação de energia $E_i = E_f$, mas $E_i = mgl(1-\cos\alpha)$ e $E_f = \frac{1}{2}mv^2$ logo $\cancel{m}gl(1-\cos\alpha) = \frac{1}{2}\cancel{m}v^2 \Rightarrow \boxed{v = \sqrt{2gl(1-\cos\alpha)}}$