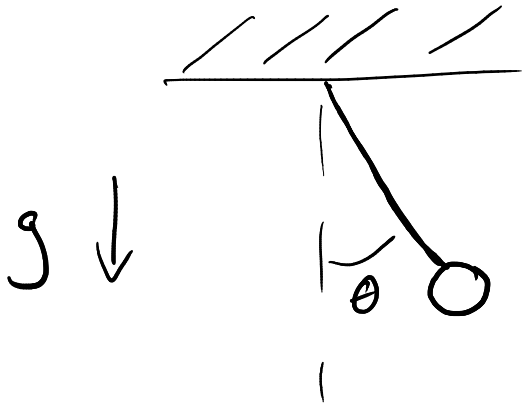
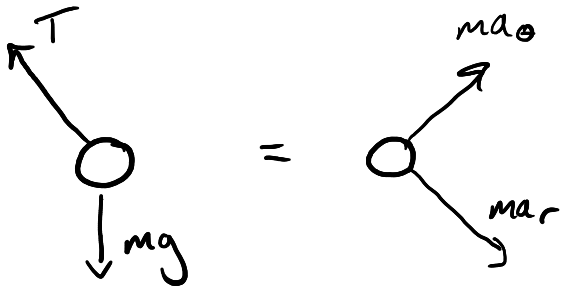
Tension in cord



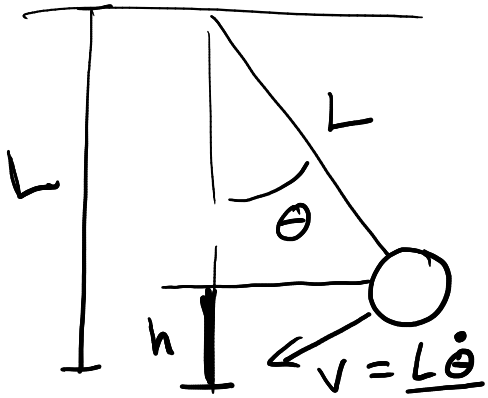


$\hat{e}_r$ ① $mg\cos\theta - T = -mr\dot{\theta}^2$

$\hat{e}_\theta$ ② $\ddot{\theta} = -\frac{g}{r}\sin\theta$

$$T = mr\dot{\theta}^2 + mg\cos\theta$$

$T_{max} \Rightarrow$ when $\theta = 0$



$$T = \tfrac{1}{2} m v^2 = \tfrac{1}{2} m L^2 \dot{\theta}^2$$

$$V = mgh$$

$$h = L - L\cos\theta$$

$$T + V = \int W \, dt$$

$$\tfrac{1}{2} m l^2 \dot{\theta}^2 + mgL(1 - \cos\theta) = \text{constant}$$