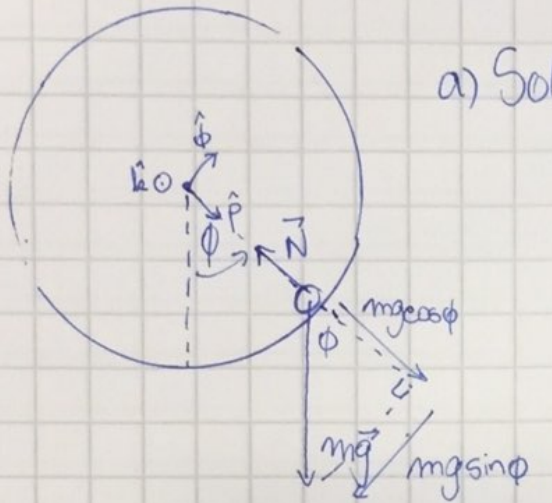
Ejercicio 2



a) Solo tenemos la normal y el peso

▷ $\vec{N} = -N\hat{\rho}$

▷ $m\vec{g} = mg\cos\phi\,\hat{\rho} - mg\sin\phi\,\hat{\phi}$

b) Ocupamos Ley de Newton

$$m\vec{a} = \sum \vec{F}$$

donde tenemos $\rho = R \Rightarrow \dot{\rho} = \ddot{\rho} = 0$ y $z = 0 \Rightarrow \dot{z} = \ddot{z} = 0$

$$\vec{a} = (\ddot{\rho} - \rho\dot{\phi}^2)\hat{\rho} + (2\dot{\rho}\dot{\phi} + \rho\ddot{\phi})\hat{\phi} + \ddot{z}\hat{k}$$

$$= -R\dot{\phi}^2\hat{\rho} + R\ddot{\phi}\hat{\phi}$$

así que nos queda → $-mR\dot{\phi}^2\hat{\rho} + mR\ddot{\phi}\hat{\phi} = -N\hat{\rho} + mg\cos\phi\,\hat{\rho} - mg\sin\phi\,\hat{\phi}$

$\hat{\rho}$) $-mR\dot{\phi}^2 = -N + mg\cos\phi$

$\hat{\phi}$) $mR\ddot{\phi} = -mg\sin\phi$

c) Ocupando truco de mecánica para $\hat{\phi}$)

$$R\dot{\phi}\frac{d\dot{\phi}}{d\phi} = -g\sin\phi \;/\int_{\phi_0}^{\phi} d\phi \Rightarrow \frac{\dot{\phi}^2}{2} - \frac{\dot{\phi}_0^2}{2} = \frac{g}{R}(\cos\phi - \cos\phi_0)$$