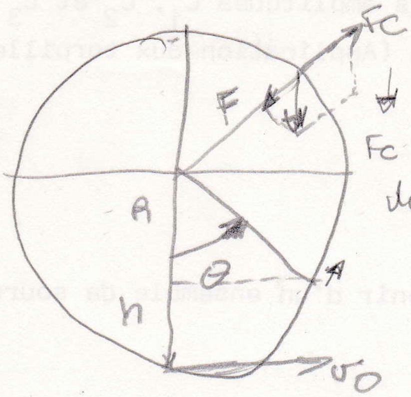

θ -
$$\omega = \frac{d\theta}{dt} \qquad v = \omega R = \left(\frac{d\theta}{dt} R\right)$$

Fc depend de v

Energie cinétique $= \frac{1}{2} m v^2 = \frac{1}{2} m \omega^2 R^2$

$$E_c = \frac{1}{2} m \omega^2 R^2$$

Energie Potentielle $E_p = mgh$

$$E_p = mgR(1-\cos\theta)$$

Langrangeen $L = E_c - E_p = \frac{1}{2} m\omega^2 R^2 - mgR(1-\cos\theta)$

$$L = \cancel{\tfrac{1}{2}} mR\left(\frac{1}{2}\omega^2 R - g(1-\cos\theta)\right)$$

Equation de Lagrange

$$\frac{d}{dt}\left(\frac{dL}{dq'_i}\right) = \frac{\partial L}{\partial q_i} \qquad \text{ici } i=1 \quad q_i = \theta \quad q'_i = \frac{d\theta}{dt} = \omega$$

$$\frac{dL}{d\omega} = mR\left(\frac{\cancel{2}\,\omega R}{\cancel{2}}\right) = mR^2\omega \quad (1)$$

$$\frac{dt}{dt}\left(\frac{dL}{d\omega}\right) = mR^2\frac{d\omega}{dt} = mR^2\frac{d^2\theta}{dt^2}$$

$$\frac{dL}{d\theta} = \frac{d}{d\theta}\left(\frac{mR^2}{2}\frac{d\theta}{dt} - g(1-\cos\theta)\right)$$

$$\frac{dL}{d\theta} = \frac{mR^2}{2}\frac{d^2\theta}{dt^2} - g\sin\theta \quad (2)$$

donc $\Rightarrow$ (1)=(2) $\quad mR^2\frac{d^2\theta}{dt^2} = \frac{mR^2}{2}\frac{d^2\theta}{dt^2} - g\sin\theta$

$$\frac{mR^2}{2}\frac{d^2\theta}{dt^2} + g\sin\theta = 0$$

Forme $F''(x) + a\sin x = 0$ avec $F'(0) = b$

solution possible $Ax + B\sin x + C = 0$