Démonstration:

- Retrouver l'équation du mouvement du pendule

$$E_c = \frac{I}{2}\dot{\theta}^2$$

$$E_p = -mgd\cos\theta + cte$$

$$\delta W = 0$$

$$\frac{\partial L}{\partial \dot{x}_i} = \frac{\partial}{\partial \dot{\theta}}\left[\frac{I}{2}\dot{\theta}^2 + mgd\cos\theta - cte\right]$$

$$= I\dot{\theta}$$

$$\frac{\partial}{\partial t}\left[\frac{\partial L}{\partial \dot{\theta}}\right] = I\ddot{\theta}$$

$$\frac{\partial L}{\partial x} = \frac{\partial}{\partial \theta}\left[\frac{I}{2}\dot{\theta}^2 + mgd\cos\theta - cte\right]$$

$$= -mgd\sin\theta$$

car $\frac{d}{dt}\left[\frac{\partial L}{\partial \dot{x}_i}\right] - \frac{\partial L}{\partial x_i} = Q_i$, et $\delta W = 0$

$$\Rightarrow I\ddot{\theta} + mgd\sin\theta = 0$$

par l'hypothèse des petits mouvmt,

$$I\ddot{\theta} + mgd\theta = 0$$

Exercice 1

```
syms q wo
b='D2q+(wo^2)*q=0';
q=dsolve(b,'q(0)=1','Dq(0)=0');
q=subs(q,wo,2*pi);
%q = exp(-pi*t*2i)/2 + exp(pi*t*2i)/2


syms E
E=0.5*((diff(q))^2+(wo^2)*(q^2))
E=subs(E,wo,2*pi);
E=simplify(E)
%E*=2*pi^2,E* est constant
```