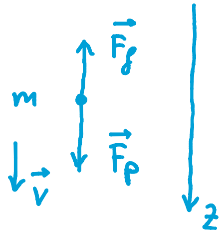
Chute verticale avec frottement et charge condensateur I

vendredi, 27 novembre 2020 09:22

Chute



Newton:

$$\sum \vec{F}_{ext} = \vec{F}_p + \vec{F}_f = m\ddot{\vec{z}}$$

$$\vec{F}_f = \lambda \vec{v}$$

$$\Rightarrow \vec{F}_p + \lambda \vec{v} = m\dot{\vec{v}}$$

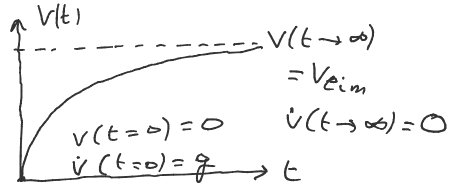
$$\begin{cases} \vec{a} = \ddot{\vec{z}} = \dot{\vec{v}} \\ \vec{v} = \dot{\vec{z}} \end{cases}$$

↙ dérivée par rapport au temps

Sur z: $F_p - \lambda v = m\dot{v}$

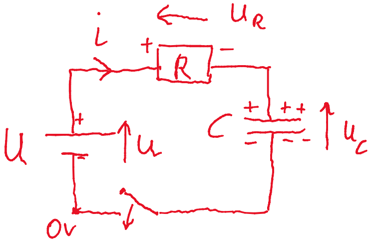
$$mg - \lambda v = m\dot{v} \quad | \div m$$

$$\boxed{\dot{v} = g - \frac{\lambda}{m} v}$$



! $\dot{v} \equiv \dot{u}_c$ $\quad v \equiv u_c$

Condensateur



Kirchhoff:

$$U - u_R - u_c = 0$$

$$u_R = R \cdot i$$

$$u_c = \frac{Q}{C} \Rightarrow \frac{du_c}{dt} = \frac{1}{C}\frac{dQ}{dt} \quad \frac{dQ}{dt} = i$$

$$\Rightarrow i = C \cdot \frac{du_c}{dt}$$

$$\Rightarrow U - RC\frac{du_c}{dt} - u_c = 0$$

$$RC\frac{du_c}{dt} = U - u_c$$

$$\frac{du_c}{dt} = \frac{U}{RC} - \frac{u_c}{RC}$$

$$\boxed{\dot{u}_c = \frac{U}{RC} - \frac{1}{RC} u_c}$$