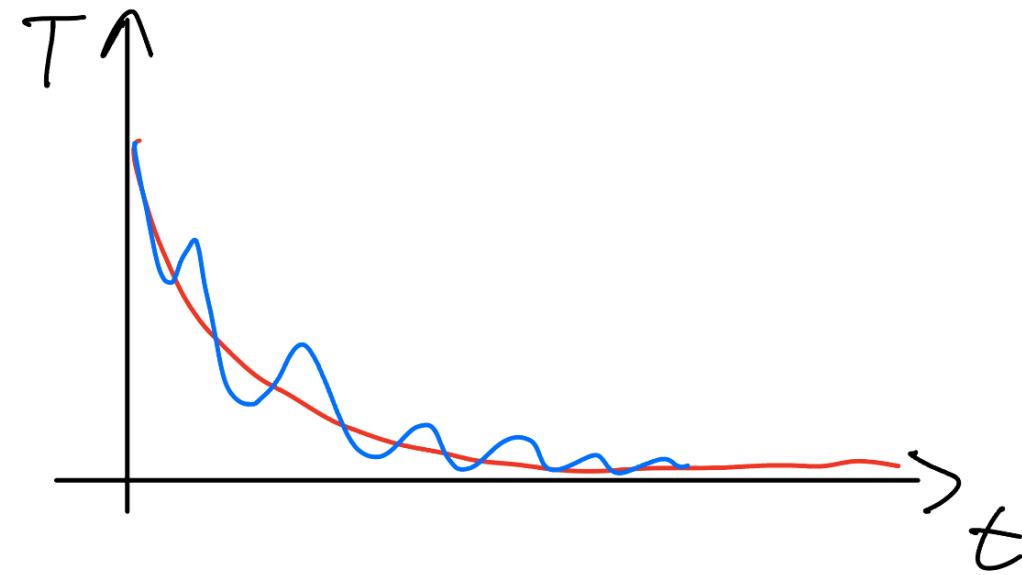


Systèmes 1^{er} et 2^{ième} ordre

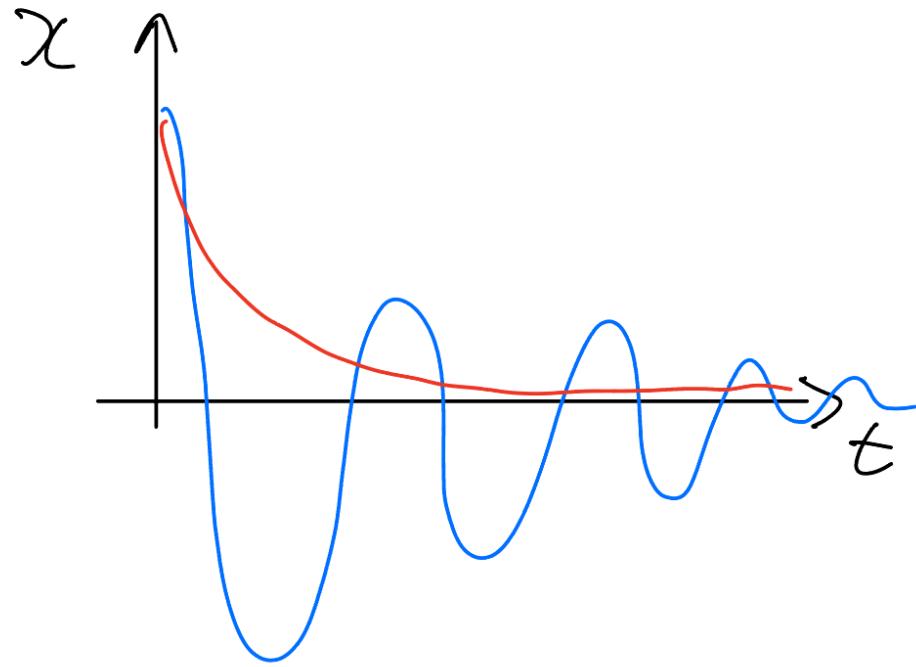
Rappel / Résumé

Systèmes 1^{er} ordre



Bleu ou rouge?

Systèmes 2^{ième} ordre



Bleu ou rouge?

Système

Ordre zéro

Equation différentielle

$$y(t) = S_0 x(t)$$

Réponse en fréquence

$$G(j\omega) = S_0$$

Premier ordre

$$\tau \dot{y}(t) + y(t) = S_0 x(t)$$

$$G(j\omega) = \frac{S_0}{1 + j\omega\tau}$$

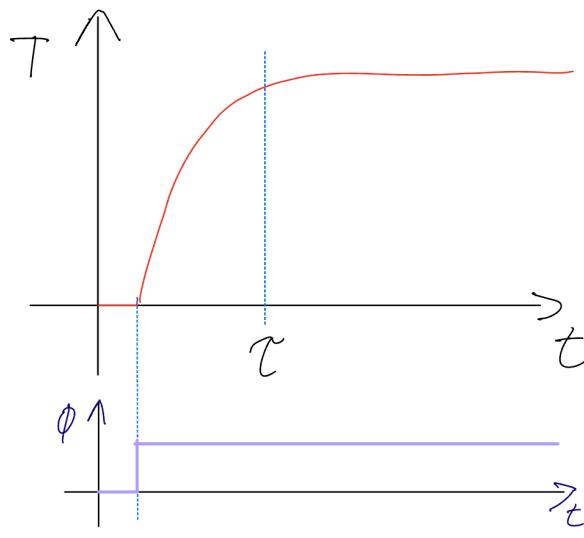
Second ordre

$$\frac{1}{\omega_0^2} \ddot{y}(t) + \frac{2\xi}{\omega_0} \dot{y}(t) + y(t) = S_0 x(t)$$

$$G(j\omega) = \frac{S_0}{1 - (\omega/\omega_0)^2 + j2\xi(\omega/\omega_0)}$$

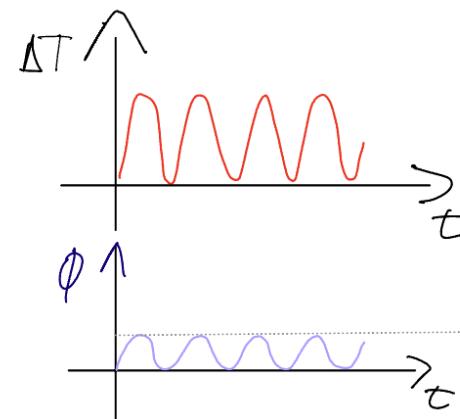
Voir chapitre «Mesure»

Systèmes 1^{er} ordre (exemple Thermique) réponse en temps

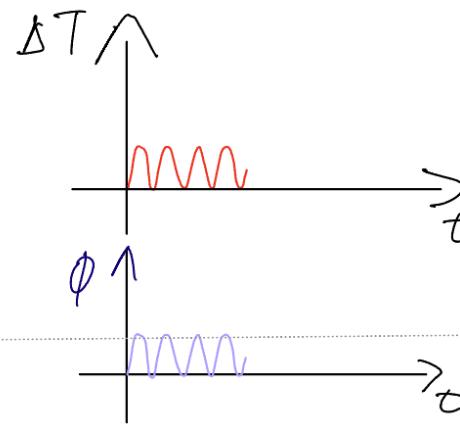


Réponse à un saut

Temps caractéristique «RC»



Réponse à un saut

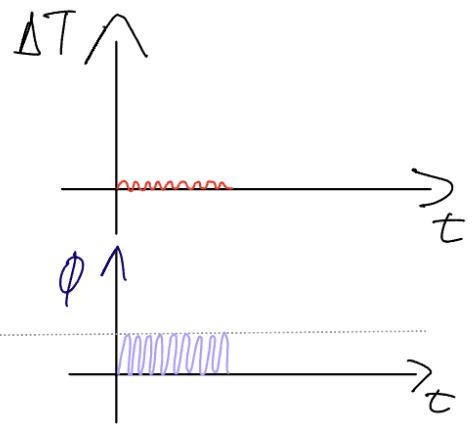
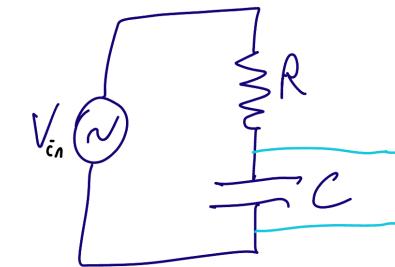


$$V_{in} = V_R + V_c$$

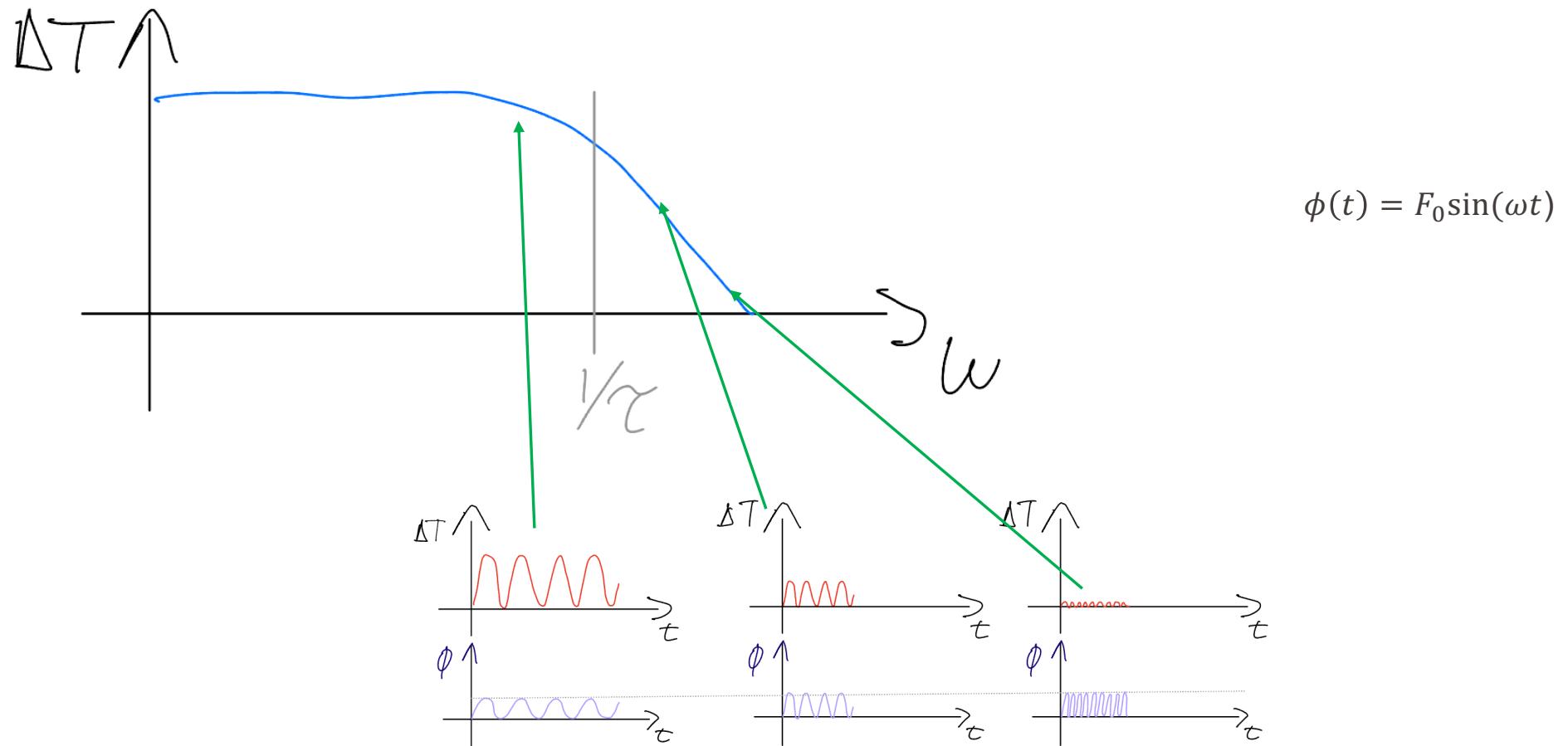
$$= IR + V_c(t)$$

$$I_c = C \frac{dV_c}{dt}$$

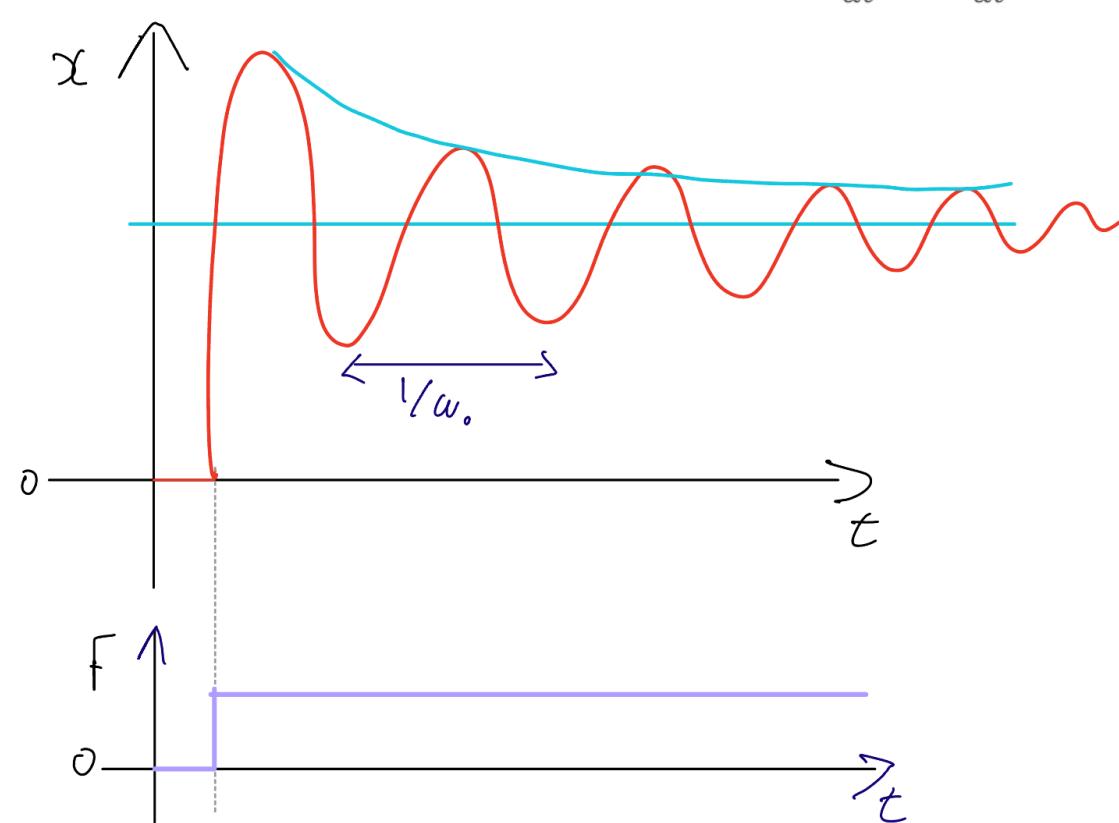
$$V_{in} = RC \frac{dV_c}{dt} + V_c$$



Systèmes 1^{er} ordre (exemple Thermique) réponse en fréquence



Systèmes 2^{ième} ordre



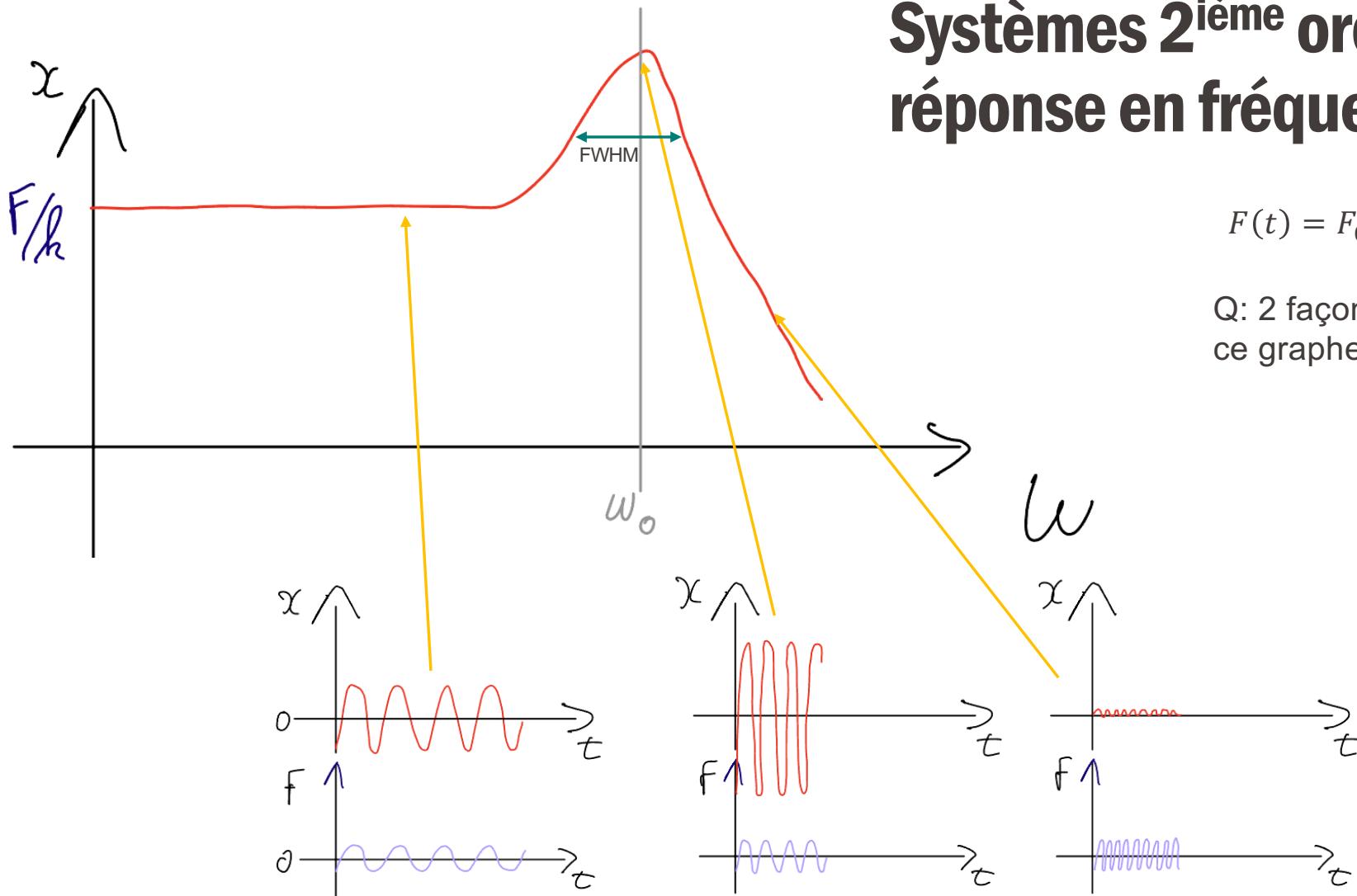
$$\frac{1}{\omega_0^2} \ddot{y}(t) + \frac{2\xi}{\omega_0} \dot{y}(t) + y(t) = F(t)$$

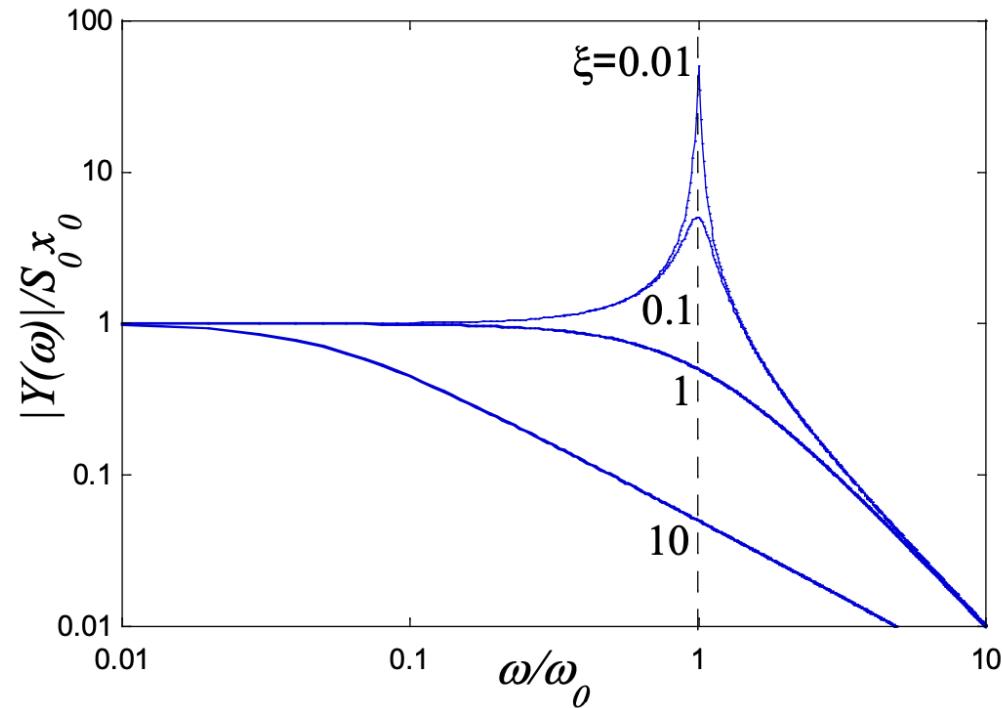
$$m \frac{d^2x}{dt^2} + c \frac{dx}{dt} + kx = f(t)$$

$$\omega_0 = \sqrt{\frac{k}{m}}$$

$$Q = \frac{\sqrt{mk}}{c}$$

Systèmes 2^{ième} ordre réponse en fréquence





Underdamped: $Q > 1$
Critically damped: $Q = 1$
Overdamped $Q < 1$

Si $Q = 10^5$??