



periodische äußere Anregung

$$F_E(t) = B \cos(\omega_{\text{ext}} t)$$

$$\sqrt{x^2} = |x|$$

$$F = -cx - b\dot{x} + F_E(t) = m\ddot{x}$$

$$\Rightarrow \ddot{x} + \frac{b}{m}\dot{x} + \frac{c}{m}x = \frac{B}{m} \cos(\omega_{\text{ext}} t)$$

Lösung:

$$x(t) = x_{\text{Einschwing}}(t) + x_{\text{Dauer}}(t)$$

$$x_{\text{Dauer}}(t) = A \cos(\omega_{\text{ext}} t + \varphi)$$

$$A(\omega_{\text{ext}}) = \frac{B}{\sqrt{(m\omega_{\text{ext}}^2 - c)^2 + b^2\omega_{\text{ext}}^2}} = \frac{B/m}{\sqrt{(\omega_{\text{ext}}^2 - \frac{c}{m})^2 + \frac{b^2}{m^2}\omega_{\text{ext}}^2}} = \frac{B/m}{\sqrt{(\omega_{\text{ext}}^2 - \omega_0^2)^2 + (2D)\omega_0\omega_{\text{ext}}^2}}$$

$$\left(\omega_0 = \sqrt{\frac{c}{m}} \quad D = \frac{b}{2m\omega_0} \right)$$

$$\text{speziell: } D=0 \rightarrow A = \frac{B/m}{|\omega_{\text{ext}}^2 - \omega_0^2|}$$

Resonanz: A groß bei $\omega_{\text{ext}} \approx \omega_0$

Experiment

$$\frac{b}{a} = 0.3 \frac{1}{s} \quad \frac{c}{a} = 1.0 \frac{1}{s^2} \quad (1/R^2)$$

$\omega_{\text{out}} \left[\frac{1}{s} \right]$	$A [L]$	φ
0.5	0.654	< 0 , klein
1	1.68	$-\frac{\pi}{2}$
2	0.163	$\approx -\pi$

