

$$\frac{d^2 x}{dt^2} + 2\gamma \frac{dx}{dt} + \omega_0^2 x = K \cos(\omega t)$$

$$x(t) = A_2 \cos(\omega t + \varphi)$$

$$\dot{x}(t) = -A_2 \omega \sin(\omega t + \varphi)$$

$$\ddot{x}(t) = -A_2 \omega^2 \cos(\omega t + \varphi)$$

gedämpfter  
gezwungener  
harmonischer  
Oszillator  
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$$-A_2 \omega^2 \cos(\omega t + \varphi) - 2\gamma A_2 \omega \sin(\omega t + \varphi) + \omega_0^2 A_2 \cos(\omega t + \varphi) = K \cos(\omega t)$$

$$\begin{aligned} & -A_2 \omega^2 (\cos \omega t \cos \varphi - \sin \omega t \sin \varphi) - \\ & - 2\gamma A_2 \omega (\sin \omega t \cos \varphi + \cos \omega t \sin \varphi) \\ & + \omega_0^2 A_2 (\cos \omega t \cos \varphi - \sin \omega t \sin \varphi) \\ & - K \cos \omega t = 0 \end{aligned}$$

$$\begin{aligned} & [(\omega_0^2 - \omega^2) A_2 \cos \varphi - 2\gamma A_2 \omega \sin \varphi - K] \cos \omega t - \\ & - [(\omega_0^2 - \omega^2) A_2 \sin \varphi + 2\gamma A_2 \omega \cos \varphi] \sin \omega t = 0 \\ & \text{für jede Zeit } t \neq 0 \Rightarrow \end{aligned}$$

$$\begin{aligned} & (\omega_0^2 - \omega^2) A_2 \cos \varphi - 2\gamma A_2 \omega \sin \varphi - K = 0 \quad (** \\ & (\omega_0^2 - \omega^2) A_2 \sin \varphi + 2\gamma A_2 \omega \cos \varphi = 0 \quad (*) \end{aligned}$$

$$\cancel{2\gamma A_2 \omega \sin \varphi} - (\omega_0^2 - \omega^2)$$

aus \*\* folgt

$$-Z_H A_2 \omega \sin \varphi = K - (\omega_0^2 - \omega^2) A_2 \cos \varphi$$

$$A_2 \sin \varphi = - \frac{K - (\omega_0^2 - \omega^2) A_2 \cos \varphi}{Z_H \omega}$$

$A_2 \sin \varphi$  einsetzen in \* ergibt

$$-(\omega_0^2 - \omega^2) \cdot \frac{K - (\omega_0^2 - \omega^2) A_2 \cos \varphi}{Z_H \omega} + Z_H A_2 \omega \cos \varphi = 0$$

$$-(\omega_0^2 - \omega^2) K + A_2 \cos \varphi (\omega_0^2 - \omega^2)^2 = -(Z_H \omega)^2 A_2 \cos \varphi$$

$$-(\omega_0^2 - \omega^2) K = -A_2 \cos \varphi (\omega_0^2 - \omega^2)^2 - (Z_H \omega)^2 A_2 \cos \varphi$$

$$+(\omega_0^2 - \omega^2) K = A_2 \cos \varphi [(\omega_0^2 - \omega^2)^2 + (Z_H \omega)^2]$$

$$A_2 \cos \varphi = \frac{(\omega_0^2 - \omega^2) K}{(\omega_0^2 - \omega^2)^2 + (Z_H \omega)^2}$$

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