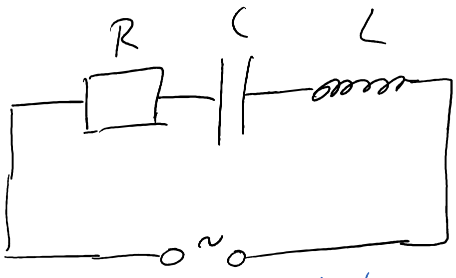
5.4.4. ERZWUNGENE SCHWINGUNG

Reihenschaltung

$\Rightarrow$ inhomogene DGL

$$\underline{L\ddot{Q}} + \underline{R\dot{Q}} + \underline{\tfrac{1}{C}Q(t)} = U_0 e^{i\omega t} = U(t)$$



$U(t) = U_0 \cdot e^{i\omega t}$

Lösungsansatz

$$\left.\begin{aligned} \dot{Q} &= I(t) = I_0 e^{i\omega t} \\ \ddot{Q} &= \dot{I}(t) = i\omega\, I(t) \\ Q &= \int I(t)\,dt = \frac{1}{i\omega} I(t) \end{aligned}\right\} \quad \underbrace{\left(i\omega L + R + \frac{1}{i\omega C}\right)}_{\text{Impedanz!}} I(t) = U(t) \leftarrow$$

Stromamplitude

$$|I(t)| = I_0 = \left|\frac{U(t)}{Z}\right| = \frac{U_0}{|Z|} =$$

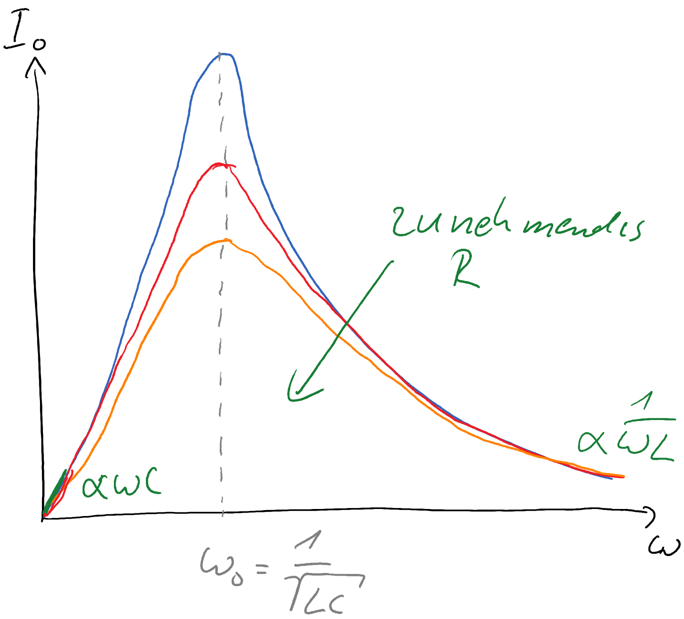
$$= \frac{U_0}{\sqrt{R^2 + \underbrace{\left(\omega L - \frac{1}{\omega C}\right)^2}}}$$

kann 0 werden

wenn $\omega L = \frac{1}{\omega C}$

bzw $\omega_0 = \frac{1}{\sqrt{LC}}$

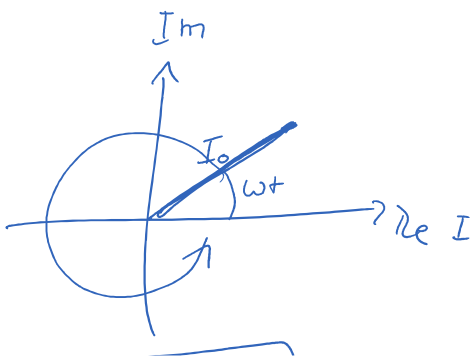
Resonanzfrequenz



Phasenverschiebung $\rightarrow$ oben

$$|z| = \sqrt{z z^*}$$

$$I = I_0 \cdot e^{i\omega t} \qquad |I|$$



$$I = I_0 \cdot e^{i\omega t} \qquad |I|$$

$$|I| = \sqrt{I_0 e^{i\omega t} \cdot I_0 \cdot e^{-i\omega t}} = \sqrt{I_0^2 e^{\underbrace{i\omega t - i\omega t}_{=0}}} =$$

$$= \sqrt{I_0^2 e^0} = I_0$$