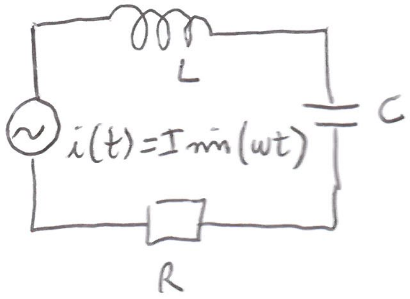
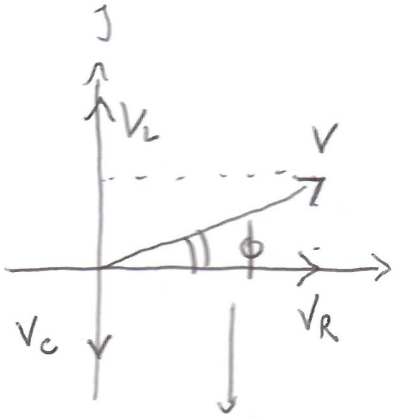


$$Z = R + j\left(\omega L - \frac{1}{\omega C}\right)$$

$$= R + j\left(X_L - X_C\right)$$

Resonance : $\mathrm{Im}(Z) = 0$

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



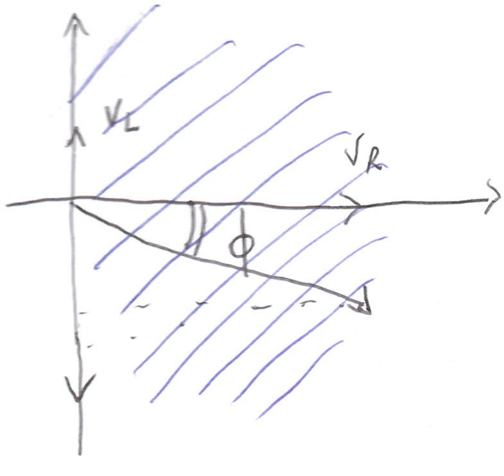
$$V = V_L + V_C + V_R$$

$$\langle p \rangle = I_{rms} V_{rms} \cos\phi$$

- $V_L > V_C$

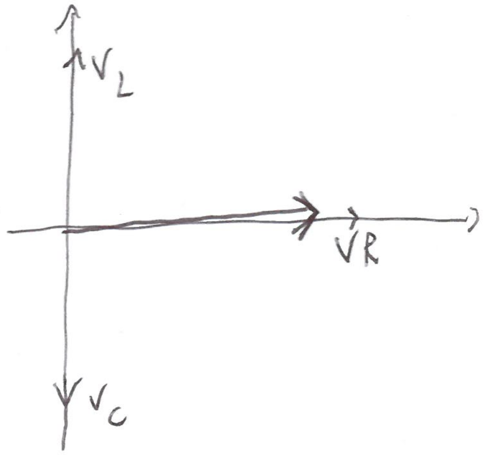
  $X_L > X_C$ ~ behaves as an inductive circuit

ϕ = phase shift between i and v



- $V_L < V_C$

  $X_L < X_C$ ~ behaves as a capacitive circuit



- $V_L = V_C$

  $X_L = X_C$ <u>Resonance</u>

$$Q = \frac{\text{energy oscillating between } L-C}{\text{energy dissipated at } R} = \frac{X_L}{R} = \frac{\omega_0 L}{R} \equiv \frac{X_C}{R} = \frac{1}{\omega_0 C R}$$

RESONANCE

$$I = \frac{V}{|Z|} = \frac{V}{\sqrt{R^2 + \left(\omega L - \frac{1}{\omega C}\right)^2}}$$

amplitude

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

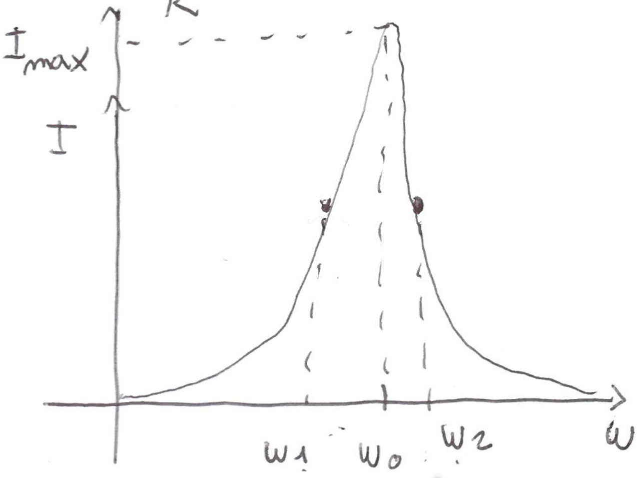
$$= \frac{V}{R\sqrt{1 + \frac{L^2}{R^2}\left(\omega - \frac{\omega_0^2}{\omega}\right)^2}}$$

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

$$= \frac{V}{R\sqrt{1 + \frac{\omega_0^2 L^2}{R^2}\left(\frac{\omega}{\omega_0} - \frac{\omega_0}{\omega}\right)^2}}$$

$$I = \frac{V}{R\sqrt{1 + Q^2\left(\frac{\omega}{\omega_0} - \frac{\omega_0}{\omega}\right)^2}} = \frac{I_{max}}{\sqrt{1 + Q^2\left(\frac{\omega}{\omega_0} - \frac{\omega_0}{\omega}\right)^2}}$$

$$Q = \frac{\omega_0 L}{R}$$



$$\begin{cases} Z_{min} \\ I_{max} \end{cases}$$

$$Q^2\left(\frac{\omega}{\omega_0} - \frac{\omega_0}{\omega}\right)^2 = 1$$

$$\Downarrow$$

$$I = \frac{I_{max}}{\sqrt{2}} \qquad \boxed{Q\left(\frac{\omega}{\omega_0} - \frac{\omega_0}{\omega}\right) = \pm 1}$$

Solutions

$$\begin{cases} \omega_1 \omega_2 = \omega_0^2 \\ \boxed{\omega_1 - \omega_2 = \frac{\omega_0}{Q}} \end{cases}$$

$$\Delta\omega = \frac{\omega_0}{Q} \; ; \quad Q = \frac{\omega_0}{\Delta\omega}$$