AC →

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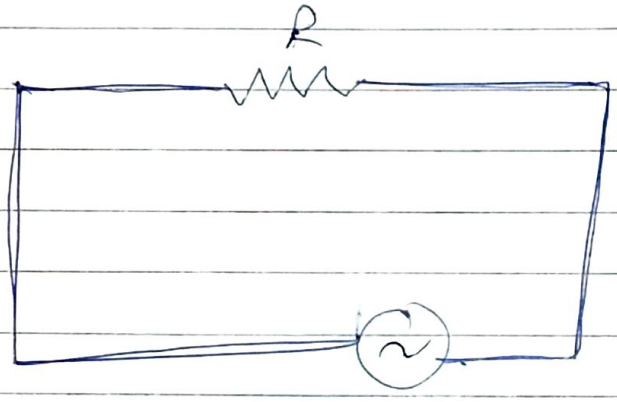
Resistor containing circuit,

Capacitor containing circuit,

Inductor containing circuit

Resistor containing circuit,



$V = V_0 \sin \omega t$

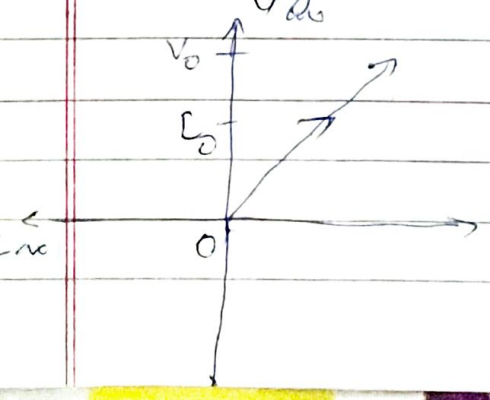
By using Ohm's Law,

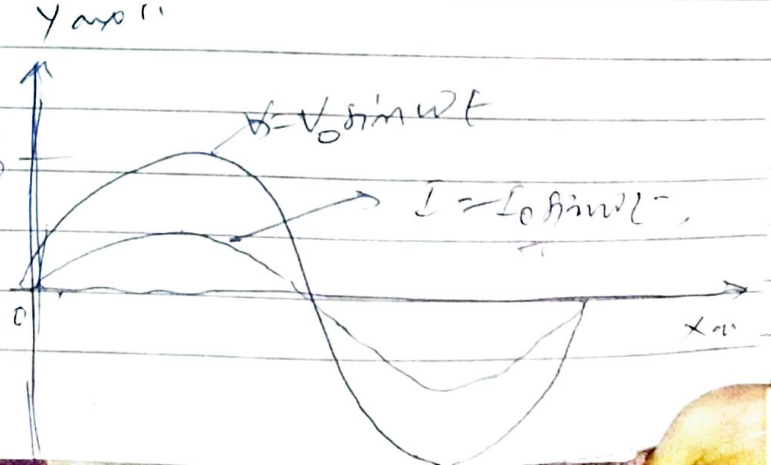
$V = IR$

$I = \frac{V_0}{R} \sin \omega t$

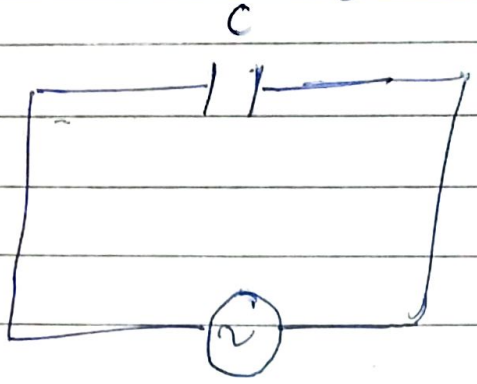
$$\boxed{I = I_0 \sin \omega t}$$

Phasor diagram





Capacitor containing circuit,



$V = V_0 \sin\omega t$

Consider an capacitor of capacitance C connected in the circuit. That p.d is

$V = V_0 \sin\omega t$

We know

$q = CV$

$q = C V_0 \sin\omega t$

$i = \frac{dq}{dt}$

$i = \frac{d(CV_0 \sin\omega t)}{dt}$

$\frac{d \sin\omega t}{dt} = \omega \cos\omega t$

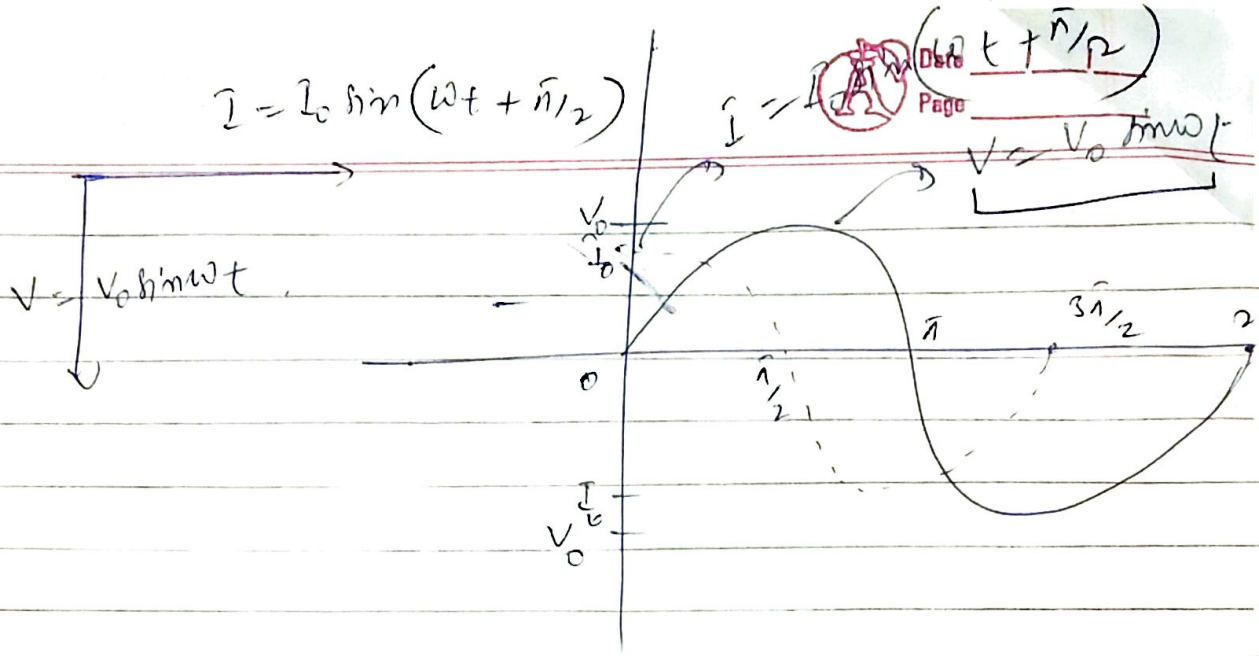
$i = C\omega V_0 \cos\omega t$

$i = \frac{V_0}{1/C\omega} \cos\omega t$

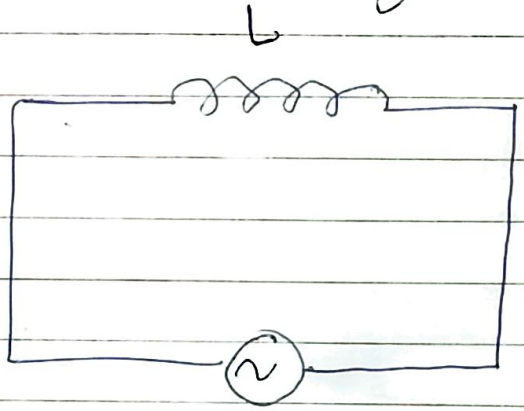
$\frac{1}{C\omega}$ = capacitive Reactance

$i = i_0 \cos\omega t$

$\boxed{i = i_0 \sin(\omega t + \pi/2)}$



Inductor containing circuit,



If an Inductor of Inductance L connected in the circuit then P.d $V = V_0 \sin\omega t$

$V = V_0 \sin\omega t$

$\mathcal{E} = -\left(-L \frac{dI}{dt}\right)$ is ac supply

$\mathcal{E} = L \frac{dI}{dt}$

$V_0 \sin\omega t = L \frac{dI}{dt}$

$\int L \, dI = \int V_0 \sin\omega t \, dt$

$$I = \frac{V_0}{L\omega}\left(-\cos\omega t\right)$$

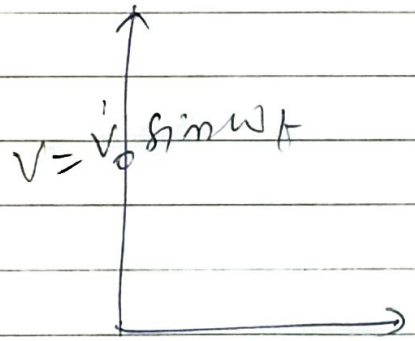
$$\int \sin\omega t\, dt = -\frac{\cos\omega t}{\omega}$$

$$= \frac{V_0}{L\omega}\cdot \sin\left(\omega t - \pi/2\right)$$

$$\boxed{X_L = L\omega}$$

↳ This is called Inductive Reactance.

$$\boxed{I = \frac{V_0}{X_L}\sin\left(\omega t - \pi/2\right)}$$



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$$I = I_0 \sin\left(\omega t - \pi/2\right)$$