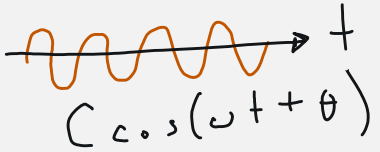
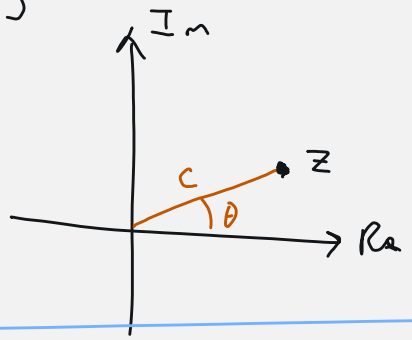
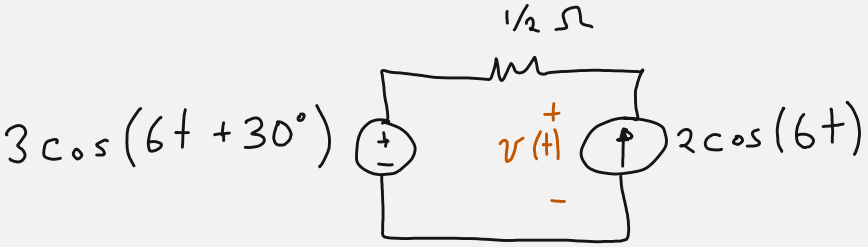
Phasors

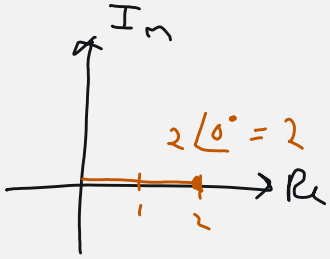
Complex number $z = C\angle\theta$ representing sinusoid

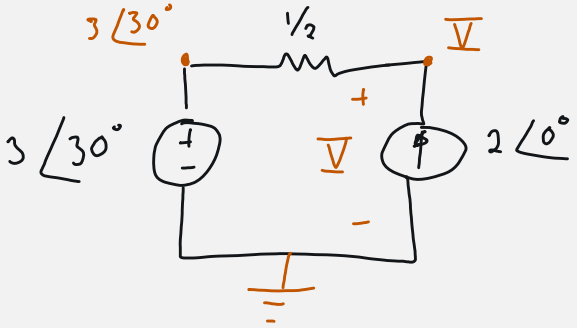


$z = C\angle\theta$









$$\underline{V}: \quad \frac{\underline{V} - 3\angle 30^\circ}{1/2} + (-2) = 0$$

$$2\underline{V} - 6\angle 30^\circ - 2 = 0$$

$$2\underline{V} = 6\angle 30^\circ + 2$$

$$\underline{V} = 3\angle 30^\circ + 1$$

$$= (3\angle 30) + 1 \quad \leftarrow \text{TI calculator}$$

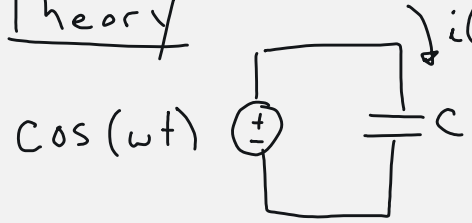
$$= 3.9\angle 23^\circ$$

Mode
complex : polar
angle : degrees

$$\boxed{v(t) = 3.9\cos(6t + 23^\circ)\ \text{V}}$$

element	impedance Z	admittance
R	$R\ \Omega$	$\frac{1}{R}\ S$
L	$j\omega L\ \Omega$	$\frac{1}{j\omega L}\ S$
C	$\frac{1}{j\omega C}\ \Omega$	$j\omega C\ S$

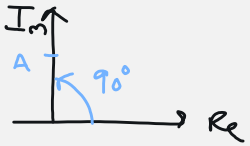
Theory



$$i(t) = Cv'(t)$$
$$= C \cdot \cos'(\omega t)$$
$$= -C\omega \sin(\omega t)$$
$$= -C\omega \cos(\omega t - 90^\circ)$$
$$I \Rightarrow -C\omega \angle -90^\circ$$
$$Z = \frac{V}{I} = \frac{1}{-C\omega \angle -90^\circ}$$
$$= \frac{1 \angle 0^\circ}{-C\omega \angle -90^\circ}$$
$$= \frac{1}{-\omega C} \angle 90^\circ$$
$$= -\frac{j}{\omega C}$$
$$= \boxed{\frac{1}{j\omega C}}$$

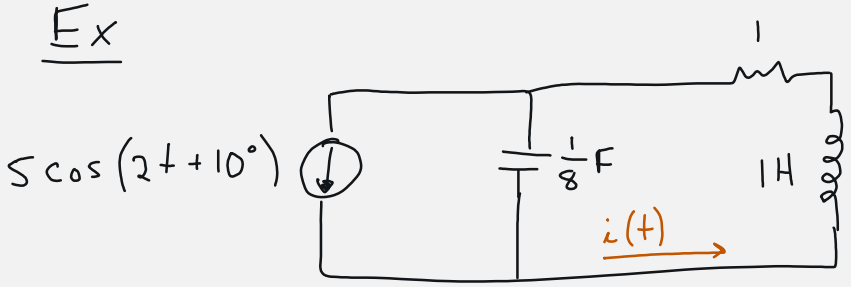
$$\frac{A \angle \theta_1}{B \angle \theta_2} = \frac{A}{B} \angle \theta_1 - \theta_2$$

$A \angle 90^\circ$
$= jA$



$$\frac{1}{j} \cdot \frac{j}{j} = \frac{j}{j^2} = \frac{j}{-1} = -j$$

Ex

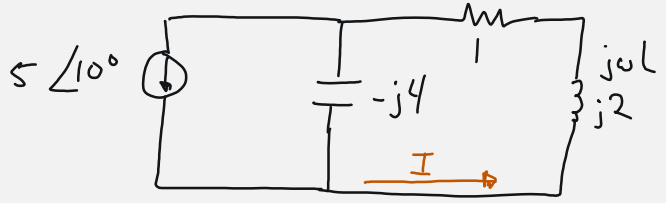


$$Z_C = \frac{1}{j\omega C} = \frac{1}{j(2)\left(\frac{1}{8}\right)} = \frac{1}{j\frac{1}{4}} = \frac{4}{j} = -j4$$

$$\frac{1}{j}\cdot\frac{j}{j} = \frac{j}{j^2} = \frac{j}{-1} = -j \qquad j = \sqrt{-1}, \quad j^2 = -1$$

$$\frac{1}{j} = -j$$

① Convert to phasor domain



② Analyze DC methods

$$I = \left(5\angle 10^\circ \; \frac{-j4}{-j4 + 1 + j2}\right) = 8.94\angle -16.5^\circ$$

③

$$i(t) = 8.94\cos(2t - 16.5^\circ)\ A$$