

1.27 Find the instantaneous time sinusoidal functions corresponding to the following phasors:

- (a) $\tilde{V} = -5e^{j\pi/3}$ (V)
- (b) $\tilde{V} = j6e^{-j\pi/4}$ (V)
- (c) $\tilde{I} = (6 + j8)$ (A)
- (d) $\tilde{I} = -3 + j2$ (A)
- (e) $\tilde{I} = j$ (A)
- (f) $\tilde{I} = 2e^{j\pi/6}$ (A)

Solution:

(a)

$$\begin{aligned}\tilde{V} &= -5 \exp j\pi/3 \text{ V} = 5 \exp j(\pi/3 - \pi) \text{ V} = 5 \exp -j2\pi/3 \text{ V}, \\ v(t) &= 5 \cos(\omega t - 2\pi/3) \text{ V}.\end{aligned}$$

(b)

$$\begin{aligned}\tilde{V} &= j6 \exp -j\pi/4 \text{ V} = 6 \exp j(-\pi/4 + \pi/2) \text{ V} = 6 \exp j\pi/4 \text{ V}, \\ v(t) &= 6 \cos(\omega t + \pi/4) \text{ V}.\end{aligned}$$

(c)

$$\begin{aligned}\tilde{I} &= (6 + j8) \text{ A} = 10 \exp j53.1^\circ \text{ A}, \\ i(t) &= 10 \cos(\omega t + 53.1^\circ) \text{ A}.\end{aligned}$$

(d)

$$\begin{aligned}\tilde{I} &= -3 + j2 = 3.61 e^{j146.31^\circ}, \\ i(t) &= \Re\{3.61 e^{j146.31^\circ} e^{j\omega t}\} = 3.61 \cos(\omega t + 146.31^\circ) \text{ A}.\end{aligned}$$

(e)

$$\begin{aligned}\tilde{I} &= j = e^{j\pi/2}, \\ i(t) &= \Re\{e^{j\pi/2} e^{j\omega t}\} = \cos(\omega t + \pi/2) = -\sin \omega t \text{ A}.\end{aligned}$$

(f)

$$\begin{aligned}\tilde{I} &= 2e^{j\pi/6}, \\ i(t) &= \Re\{2e^{j\pi/6} e^{j\omega t}\} = 2 \cos(\omega t + \pi/6) \text{ A}.\end{aligned}$$
