

1.27 Find the phasors of the following time functions:

- (a) $v(t) = 6 \cos(\omega t - \pi/6)$ (V)
- (b) $v(t) = 12 \sin(\omega t - \pi/4)$ (V)
- (c) $i(x, t) = 5e^{-2x} \sin(\omega t + \pi/6)$ (A)
- (d) $i(t) = -2 \cos(\omega t - 3\pi/4)$ (A)
- (e) $i(t) = 4 \sin(\omega t + \pi/3) + 7 \cos(\omega t - \pi/6)$ (A)

Solution:

(a) $\tilde{V} = 6 \exp - j\pi/6$ V.

(b) $v(t) = 12 \sin(\omega t - \pi/4) = 12 \cos(\pi/2 - (\omega t - \pi/4)) = 12 \cos(\omega t + \pi/4)$ V,
 $\tilde{V} = 12 \exp + j\pi/4$ V.

(c)

$$\begin{aligned} i(t) &= 5 \exp - 2x \sin(\omega t + \pi/6) \text{ A} = 5 \exp - 2x \cos[\pi/2 - (\omega t + \pi/6)] \text{ A} \\ &= 5 \exp - 2x \cos(\omega t - \pi/3) \text{ A}, \\ \tilde{I} &= 5 \exp - 2x \exp - j\pi/3 \text{ A}. \end{aligned}$$

(d)

$$\begin{aligned} i(t) &= -2 \cos(\omega t - 3\pi/4), \\ \tilde{I} &= -2e^{-j3\pi/4} = 2e^{-j\pi}e^{-j3\pi/4} = 2e^{+j\pi/4} \text{ A}. \end{aligned}$$

(e)

$$\begin{aligned} i(t) &= 4 \sin(\omega t + \pi/3) + 7 \cos(\omega t - \pi/6) \\ &= 4 \cos[\pi/2 - (\omega t + \pi/3)] + 7 \cos(\omega t - \pi/6) \\ &= 4 \cos(-\omega t + \pi/6) + 7 \cos(\omega t - \pi/6) \\ &= 4 \cos(\omega t - \pi/6) + 7 \cos(\omega t - \pi/6) = 10 \cos(\omega t - \pi/6), \\ \tilde{I} &= 10e^{-j\pi/6} \text{ A}. \end{aligned}$$
