

**1.26** Find the phasors of the following time functions:

- (a)  $v(t) = 9 \cos(\omega t - \pi/3)$  (V)
- (b)  $v(t) = 12 \sin(\omega t + \pi/4)$  (V)
- (c)  $i(x, t) = 5e^{-3x} \sin(\omega t + \pi/6)$  (A)
- (d)  $i(t) = -2 \cos(\omega t + 3\pi/4)$  (A)
- (e)  $i(t) = 4 \sin(\omega t + \pi/3) + 3 \cos(\omega t - \pi/6)$  (A)

**Solution:**

(a)  $\tilde{V} = 9 \exp - j\pi/3$  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)

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

(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)

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

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