**Ex:** Given $\omega = 1\text{ k rad/sec}$, write inverse phasors for each of the following signals:

a) $I = 12e^{j30^\circ} \text{ A}$

b) $V = -j \text{ V}$

c) $I = -7 \text{ A}$

d) $V = 4(\sqrt{3} + j) e^{j60^\circ} \text{ V}$

e) $I = e^{-\pi - j30^\circ} \text{ A}$

**SOL’N:**

a) The magnitude is the magnitude of $\cos(\omega t)$, and the angle in the exponent is the phase shift of the time-domain waveform.

$$P^{-1}[I = 12e^{j30^\circ} \text{ A}] = 12\cos(\omega t + 30^\circ) \text{ A}$$

b) One way to proceed is to first put the phasor in pure polar form.

$$P^{-1}[V = -j \text{ V}] = P^{-1}[e^{-j90^\circ} \text{ V}] = \cos(\omega t - 90^\circ) \text{ V}$$

**NOTE:** We could also say $P^{-1}[-j \text{ V}] = \sin(\omega t) \text{ V}$ since $
\cos(\omega t - 90^\circ) = \sin(\omega t)$

c) A minus sign is equivalent to a $\pm180^\circ$ phase shift.

$$P^{-1}[I = -7 \text{ A}] = P^{-1}[e^{j180^\circ} 7 \text{ A}] = P^{-1}[7e^{j180^\circ} \text{ A}] = 7\cos(\omega t + 180^\circ) \text{ A}$$

d) We multiply terms after converting them to polar form.

$$P^{-1}[V = 4(\sqrt{3} + j) e^{j60^\circ} \text{ V}] = P^{-1}[4 \cdot 2e^{j30^\circ} e^{j60^\circ} \text{ V}] = P^{-1}[8e^{j90^\circ} \text{ V}]$$

or

$$P^{-1}[V] = P^{-1}[8e^{j90^\circ} \text{ V}] = 8\cos(\omega t + 90^\circ) \text{ V}$$

**NOTE:** We could also say $P^{-1}[V] = -8\sin(\omega t) \text{ V}$ since $
\cos(\omega t + 90^\circ) = -\sin(\omega t)$

e) The real exponent yields the magnitude.
$P^{-1} \left[ I = e^{-\pi - j30^\circ} A = e^{-\pi} \angle -30^\circ \ A \right] = e^{-\pi} \cos(\omega t - 30^\circ) \ A$