EX: If $\mathrm{f}(t) = 2\sin(\omega t + \pi/3)$ find $\mathbf{P}[\mathrm{f}(t)]$, (i.e., find the phasor)

ANS: $\mathbf{P}[\mathrm{f}(t)] \equiv \mathbf{F} = 2e^{-j\pi/6} \equiv 2\angle\pi/6$

SOL'N: If we have a cosine, we use the standard identity for phasors:

$$\mathbf{P}[A\cos(\omega t + \phi)] = Ae^{j\phi} \equiv A\angle\phi$$

For a sine, we multiply the standard identity by -*j* (which is the phasor for a sine of magnitude one and zero phase shift):

$$\mathbf{P}[\sin(\omega t)] = -j \equiv 1\angle -90°$$

Thus, we have

$$\mathbf{P}[\mathrm{f}(t)] \equiv \mathbf{F} = -2je^{j\pi/3}.$$

The above is mathematically correct and works properly in solving problems, but we will apply identities to express the answer in standard form:

$$-1 = e^{j180°} = e^{-j180°} = e^{j\pi} = e^{-j\pi}.$$

NOTE: (We use whichever of +180° or –180° is most convenient.)

$$j = e^{j90°} = e^{j\pi/2}.$$

Applying the identities:

$$\mathbf{F} = -2je^{j\pi/3} = 2e^{-j\pi}e^{j\pi/2}e^{j\pi/3} = 2e^{-j\pi/6} \equiv 2\angle -\pi/6.$$