

EE 3340
Homework Problem #006

(a) Convert $f(t) = 10 \sin(2\pi t - 60^\circ)$ to the form $f(t) = A \cos(\omega t + \theta)$, where θ is in radians.

$$\begin{aligned} f(t) &= 10 \sin(2\pi t - 60^\circ) \\ &= 10 \cos(2\pi t - 60^\circ - 90^\circ) \\ &= 10 \cos(2\pi t - 150^\circ) \\ &\approx 10 \cos(2\pi t - 2.62) \end{aligned}$$

(b) Convert $g(t) = 3 \sin(377t + 45^\circ)$ to the form $f(t) = B \cos(\omega t) + C \sin(\omega t)$.

$$\begin{aligned} g(t) &= 3 \sin(377t + 45^\circ) \\ &= (3 \cos 45^\circ) \cos 377t + (3 \sin 45^\circ) \sin 377t \\ &\approx 2.12 \cos 377t + 2.12 \sin 377t \end{aligned}$$

(c) A signal whose frequency is 60 Hz is given in polar (or phasor) form as $\mathbf{H} = 20 \angle 40^\circ$. Determine the corresponding time-domain representation, $h(t)$, for this signal.

$$\begin{aligned} f &= 60 \text{ Hz} \Rightarrow \omega = 2\pi(60) = 377 \text{ rad/s} \\ \therefore h(t) &= 20 \cos(377t + 40^\circ) \end{aligned}$$