EE 3340

Homework Problem #007

a. Convert $g(t) = B\sin(\omega t - 37°)$ to the form $g(t) = B\cos(\omega t + \phi)$, where ϕ is in radians. (Evaluate ϕ.)

$$g(t) = B\cos(\omega t - 37° - 90°)$$
$$= B\cos(\omega t - 127°)$$
$$\approx B\cos(\omega t - 2.22)$$
$$\phi = -2.22 \text{ rad.}$$

b. Express $v(t) = \sqrt{2}\cos(\omega t + 45°)$ in the form $v(t) = V_1\cos\omega t + V_2\sin\omega t$. (Find the values of V_1 and V_2.)

$$v(t) = \sqrt{2}\cos 45°\cos\omega t - \sqrt{2}\sin 45°\sin\omega t$$
$$= \cos\omega t - \sin\omega t$$

$$V_1 = 1, \quad V_2 = -1$$

c. A sinusoidal voltage $v(t)$ is $160\angle 37°$ V in phasor form. If the frequency is 60 Hz, determine the value of $v(t)$ when $t = 34$ ms.

$$v(t) = 160\cos(2\pi \cdot 60t + 37°) \text{ V}$$
$$= 160\cos(120\pi t + 0.646) \text{ V}$$
$$v(34\text{ms}) = 160\cos(13.46) \text{ V}$$
$$\approx 100 \text{ V}$$