

ex. Compute $V(t) = 15 \cos(400t + 10^\circ) - 6 \cos(400t - 60^\circ) \text{ V}$
 ω for both terms is 400 rad/s . Therefore, use of phasors is allowed.

Phasors $\underline{V} = (15 \angle 10^\circ) - (6 \angle -60^\circ) = 14.12 \angle 33.5^\circ \text{ V}$

$V(t) = 14.12 \cos(400t + 33.5^\circ) \text{ V}$

Time-Domain

$$\begin{aligned}
 V(t) &= 15 \cos(400t + 10^\circ) - 6 \cos(400t - 60^\circ) \text{ V} \quad \left. \begin{array}{l} \text{Trig ID} \\ \cos(A+B) \end{array} \right\} \\
 &= 15 \left[\cos(400t) \cos 10^\circ - \sin(400t) \sin 10^\circ \right] \\
 &\quad - 6 \left[\cos(400t) \cos(-60^\circ) - \sin(400t) \sin(-60^\circ) \right] \quad \left. \begin{array}{l} \text{Gather} \\ \text{like terms} \end{array} \right\} \\
 &= \left[15 \cos 10^\circ - 6 \cos(-60^\circ) \right] \cos 400t - \left[15 \sin 10^\circ - 6 \sin(-60^\circ) \right] \sin 400t \\
 &= V_m \cos(A+B) \quad \text{where } A = 400t, \text{ and we need} \\
 &\quad \text{to find } V_m \text{ and } B
 \end{aligned}$$

By Trig ID for $\cos(A+B) = \cos A \cos B - \sin A \sin B$

$$V_m \cos B = 15 \cos 10^\circ - 6 \cos(-60^\circ) = 11.7721$$

$$V_m \sin B = 15 \sin 10^\circ - 6 \sin(-60^\circ) = 7.8009$$

Take ratio $\frac{V_m \sin B}{V_m \cos B} = \tan B = \frac{7.8009}{11.7721} \Rightarrow B = 33.53^\circ$

from $V_m \sin 33.53^\circ = 7.8009 \Rightarrow V_m = 14.12$

$V(t) = 14.12 \cos(400t + 33.53^\circ) \text{ V}$

Same answer, lots more work!