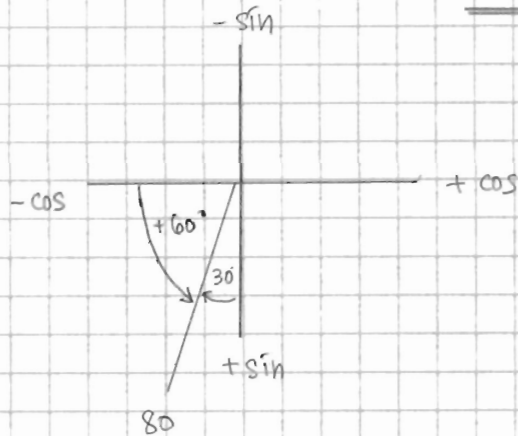


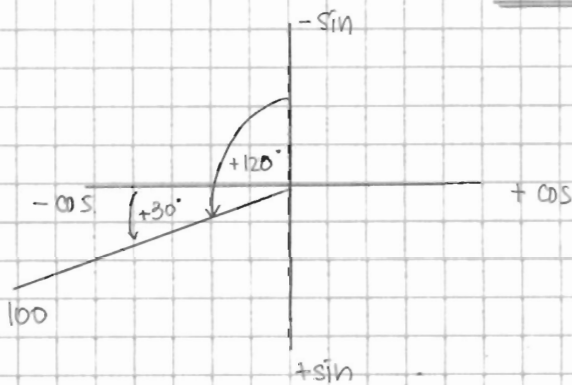
ECE 301  
HW #7 SOLUTION

#1. Use the graphical method to express the following functions as cosine functions

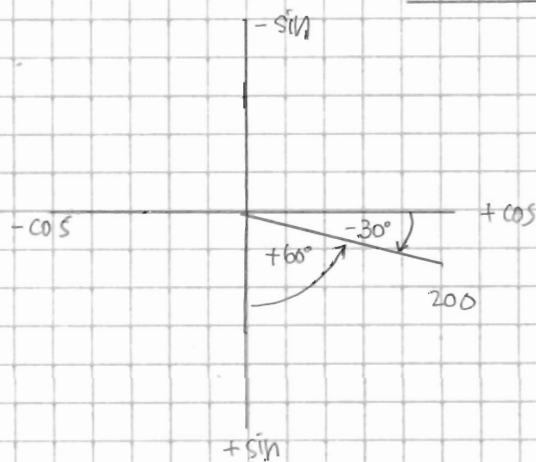
(i)  $80 \sin(\omega t - 30^\circ) = \underline{\underline{-80 \cos(\omega t + 60^\circ)}}$



(ii)  $-100 \sin(\omega t + 120^\circ) = \underline{\underline{-100 \cos(\omega t + 30^\circ)}}$



(iii)  $200 \sin(\omega t + 60^\circ) = \underline{\underline{200 \cos(\omega t - 30^\circ)}}$



#2. Given:  $\frac{(2+j4)(6-j8)}{(3+j10)}$

(a) Evaluate the function above using trig.  $\angle$  algebra.

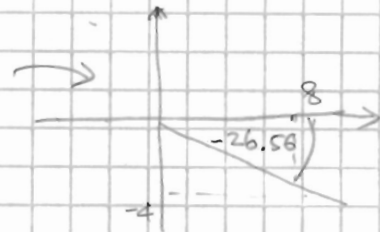
$$\frac{(2+j4)(6-j8)}{(3+j10)} = \frac{(8-j4)}{(3+j10)} = \frac{a_1 + jb_1}{a_2 + jb_2}$$

$$r_1 = \sqrt{a_1^2 + b_1^2} = \sqrt{8^2 + (-4)^2} = 8.94$$

$$r_2 = \sqrt{a_2^2 + b_2^2} = \sqrt{3^2 + 10^2} = 10.44$$

$$\theta_1 = \tan^{-1}\left(\frac{-4}{8}\right) = -26.56^\circ$$

$$\theta_2 = \tan^{-1}\left(\frac{10}{3}\right) = 73.3^\circ$$



And

$$r = \frac{r_1}{r_2} = \frac{8.94}{10.44} = 0.856$$

$$\theta = \theta_1 - \theta_2 = -26.56^\circ - 73.3^\circ = -99.86^\circ$$

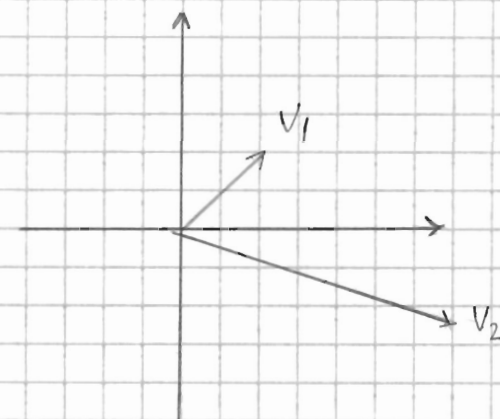
$$\therefore \frac{(2+j4)(6-j8)}{(3+j10)} = \frac{(8-j4)}{(3+j10)} = \underline{\underline{0.856 \angle -99.86^\circ}}$$

(b) Evaluate the function using calculator, we have 0.856  $\angle$  -99.86 $^\circ$

#3. Evaluate using the calculator:

$$(a) \quad V_1 = \frac{(24 + j17)(19 - j8)}{(2 + j6)(-8 - j14)} = \underline{\underline{5.95 \angle 60.66^\circ}}$$

$$(b) \quad V_2 = \frac{(50 \angle 60^\circ)(45 - j85)}{(6 + j14)} = \underline{\underline{169 \angle -35.86^\circ}}$$



$\therefore \underline{\underline{V_1 \text{ is leading.}}}$

#4 Use calculator:  $A = \frac{(2 - j3)(12 + j18)}{(3 + j8)(6 - j4)} = \underline{\underline{1.266 \angle -35.75^\circ}}$

#5 Use calculator:  $A = \frac{(6 \angle 30^\circ)(2 + j4)}{(6 - j12)(2 \angle -45^\circ)} = \underline{\underline{-0.928 - j0.373}}$

#6 Use calculator:  $A = \frac{(8 - j6) + (9 - j8)}{(14 \angle -30^\circ) + (20 \angle 60^\circ)} = \underline{\underline{0.755 \angle -74.41^\circ}}$

#7. (a)  $-50 \sin(100t - 30^\circ) = 50 \cos(100t + 60^\circ) = \underline{\underline{50 \angle 60^\circ}}$

(b)  $200 \cos(300t + 60^\circ) = \underline{\underline{200 \angle 60^\circ}}$

(c)  $-200 \cos(300t + 60^\circ) = \underline{\underline{-200 \angle 60^\circ}}$

(d)  $400 \sin(\omega t + 30^\circ) = 400 \cos(\omega t - 60^\circ) = \underline{\underline{400 \angle -60^\circ}}$