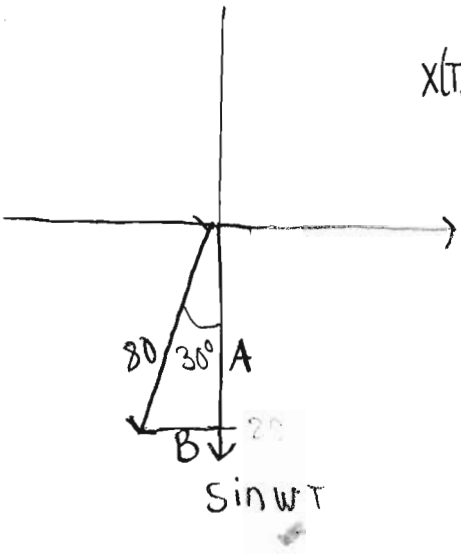
HW 9

1i

$x(t) = 80 \sin(\omega t - 30^\circ)$



$-30^\circ = \tan^{-1} B/A$

$80 = \sqrt{A^2 + B^2}$

$B = -.57735A$

$6400 = A^2 + .3333A^2$

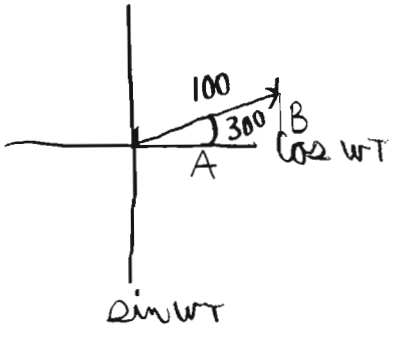
$A = 69.282 \quad B = -40$

$x(t) = -40 \cos \omega t + 69.282 \cos(\omega t - 90^\circ)$

1ii $x(t) = -100 \sin(\omega t + 120^\circ)$

$30^\circ = \tan^{-1} B/A$

$B = .57735A \qquad 100 = \sqrt{A^2 + B^2}$



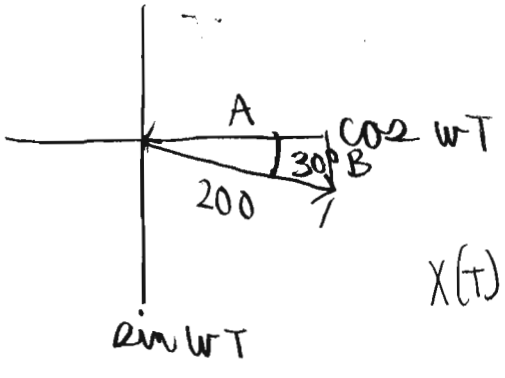
$10{,}000 = A^2 + .3333A^2$

$A = 86.603 \quad B = 50$

$x(t) = 86.603 \cos \omega t + 50 \cos(\omega t + 90^\circ)$

1iii $x(t) = 200 \sin(\omega t + 60)$

$30^\circ = \tan^{-1} B/A \qquad 200 = \sqrt{A^2 + B^2}$



$40{,}000 = A^2 + .3333A^2$

$A = 173.205 \quad B = 100$

$x(t) = 173.205 \cos \omega t + 100 \cos(\omega t - 90^\circ)$

HW 9

(2a) $X = \dfrac{(2+j4)+(6-j8)}{(3+j10)}$ $\qquad (2+j4)+(6-j8)=(8-j4)$

$r_1 = \sqrt{8^2+(-4)^2} = 8.944$

$X = \dfrac{(8-j4)}{(3+j10)}$ $\qquad (8-j4) = r_1 \angle \theta_1$ $\qquad r_2 = \sqrt{3^2+10^2} = 10.440$

$(3+j10) = r_2 \angle \theta_2$

$\theta_1 = \tan^{-1}(-4/8) = -26.565^\circ$ $\qquad \theta_2 = \tan^{-1}(10/3) = 73.301$

$$X = \frac{8.944 \angle -26.565^\circ}{10.440 \angle 73.301^\circ} = \frac{8.944}{10.440} \angle -26.565^\circ - 73.301^\circ$$

$$X = .857 \angle -99.866^\circ$$

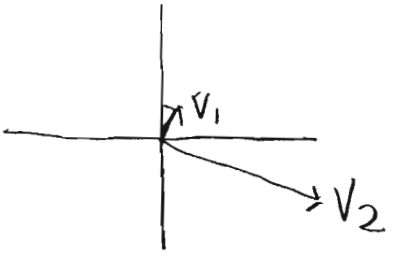
(2b) $X = .857 \angle -99.866^\circ$

(3a) $$V_1 = \frac{(24+j17)(19-j8)}{(2+j6)(-8-j14)} = \frac{(592+j131)}{(68-j76)}$$

$V_1 = 5.945 \angle 60.657^\circ$

(3b) $$V_2 = \frac{50\angle 60^\circ (45-j25)}{(6+j14)} = \frac{(2207.532,\ 1323.557)}{(6+j14)}$$

$V_2 = 168.985 \angle -35.856$



V_1 is leading

HW 9

④ $A = \dfrac{(2-j3)(12+j18)}{(3+j8)(6-j4)} = \dfrac{(78+j0)}{(50+j36)}$

$A = 1.266 \angle -35.75^\circ$

⑤ $A = \dfrac{6\angle 30^\circ (2+j4)}{(6-j12)(2\angle -45^\circ)} = \dfrac{(1.6077+j26.7846)}{(-8.4853-j25.4558)}$

$A = (-.966 - j.259)$

⑥ $A = \dfrac{(3-j6)+(9-j8)}{14\angle -30^\circ + 20\angle 60^\circ} = \dfrac{12-j14}{24.4131 \angle 25.008}$

$A = .7553 \angle -74.407$

⑦a $x = -50 \sin(100T - 30^\circ)$

$X_{phasor} = -50 \angle -120^\circ$

⑦b $x = 200 \cos(300T + 60^\circ)$

$X = 200 \angle 60^\circ$

⑦c $x = -200 \cos(300T + 60^\circ)$

$X = -200 \angle 60^\circ$

⑦d $x = 400 \sin(\omega T + 30^\circ)$

$X = 400 \angle -60$