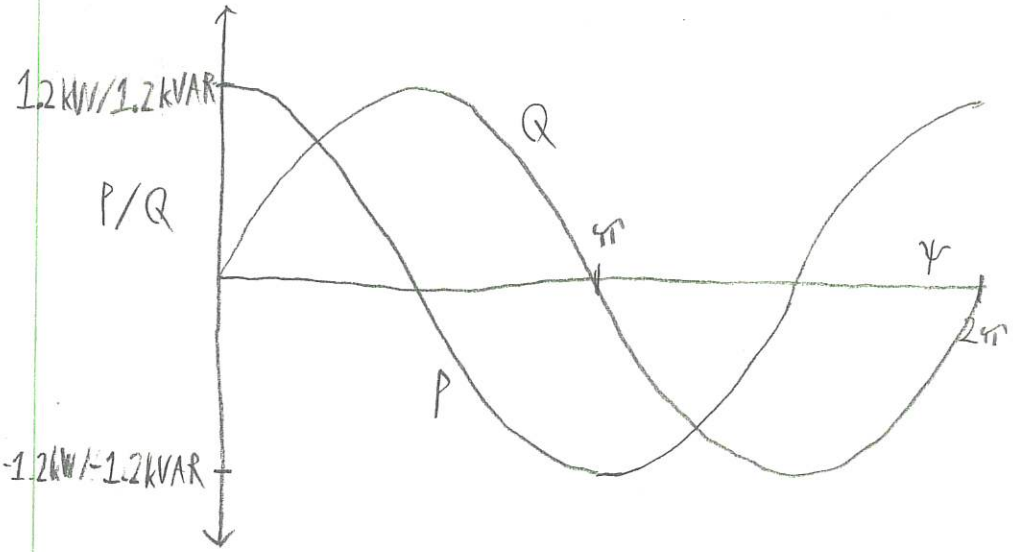
2.5

a

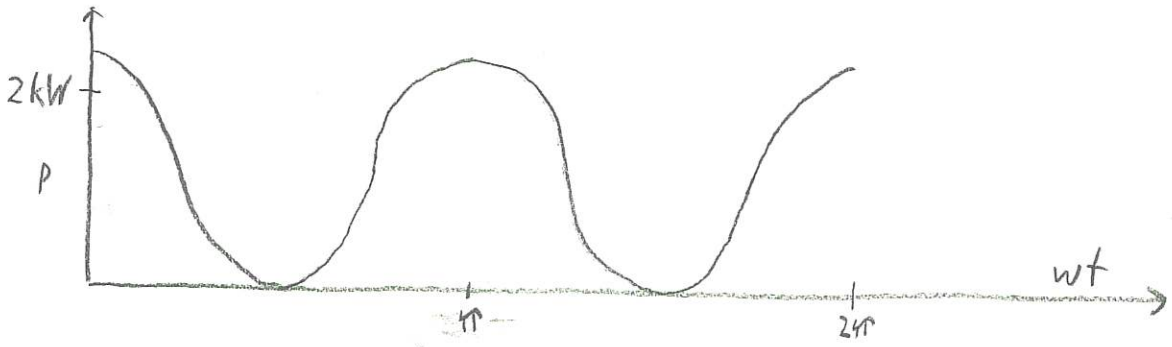


b $p = v_i = -\sqrt{2}\,Re[Ve^{j\omega t}]\,-\sqrt{2}\,Re[Ie^{j\omega t}]$

$= 2Re[V(\cos(\omega t)+j\sin(\omega t))]\,Re[I(\cos(\omega t)+j\sin(\omega t))]$

$= 2V\cos(\omega t)\,I\cos(\omega t)$

$= 2{,}400\cos^2(\omega t)$



2.5c $p = v i = \sqrt{2}\,\mathrm{Re}[V e^{j\omega t}]\sqrt{2}\,\mathrm{Re}[I e^{j(\omega t-\psi)}]$

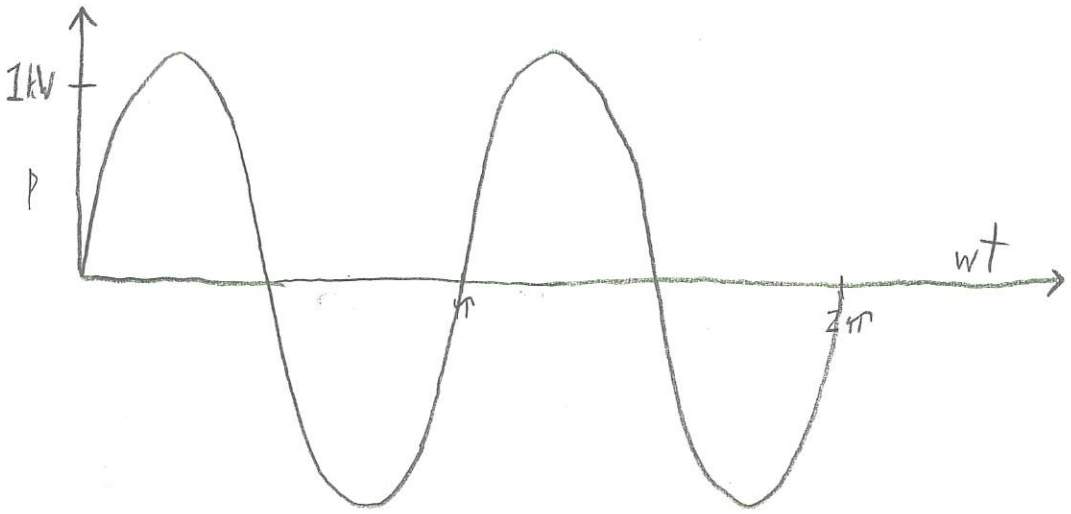
$= 2\,\mathrm{Re}[V(\cos(\omega t)+j\sin(\omega t))]\,\mathrm{Re}[I(\cos(\omega t-\psi)+j\sin(\omega t-\psi))]$

$= 2VI\cos(\omega t)\cos(\omega t-\frac{\pi}{2})$

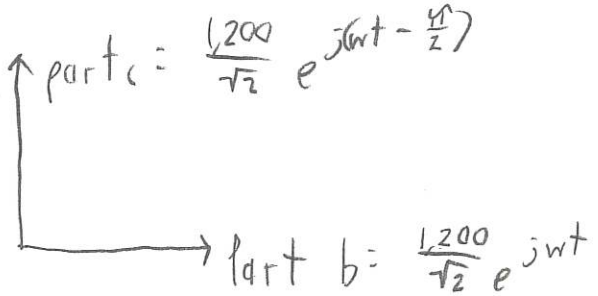
$= VI(\cos(\frac{\pi}{2})+\cos(2\omega t-\frac{\pi}{2}))$

$= VI\cos(2\omega t-\frac{\pi}{2})$

$= VI\sin(2\omega t)$

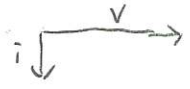


d



part b:

part c:



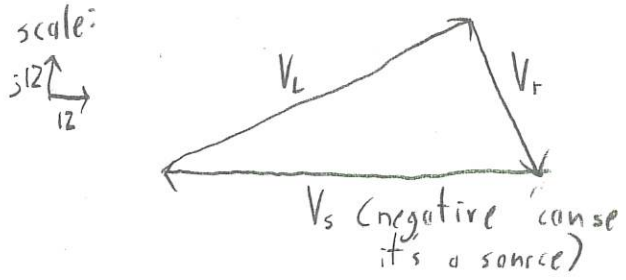
2.6a $V_r = \frac{V_s R}{R + jX}$

$= 24 - j48$

recall that $X = \omega L$

b $V_L = \frac{V_s jX}{R + jX}$

$= 96 + j48$



c current $= \frac{V_s}{R + jX}$

$= 2.4 - j4.8$

Real power: 288 W

Reactive power: 576 VAR

2.7 a $i_r = \frac{I_s jX}{R+jX}$

$i_s = \frac{V_s}{R // jX}$

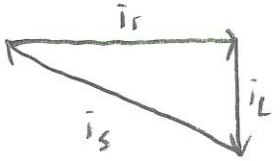
$= \frac{V_s(R+jX)}{RjX}$

$i_s = 12 - j6$

$i_r = 12$

b $i_L = \frac{I_s R}{R+jX}$

$= -j6$



c Real power: 1,440 W

Reactive power: 720 VAR