Problem 3-2

(a) $v = \sqrt{2}\,120 \cos \omega t$, $i = \sqrt{2} \cos(\omega t - 30°)$

$\phi = 30°$

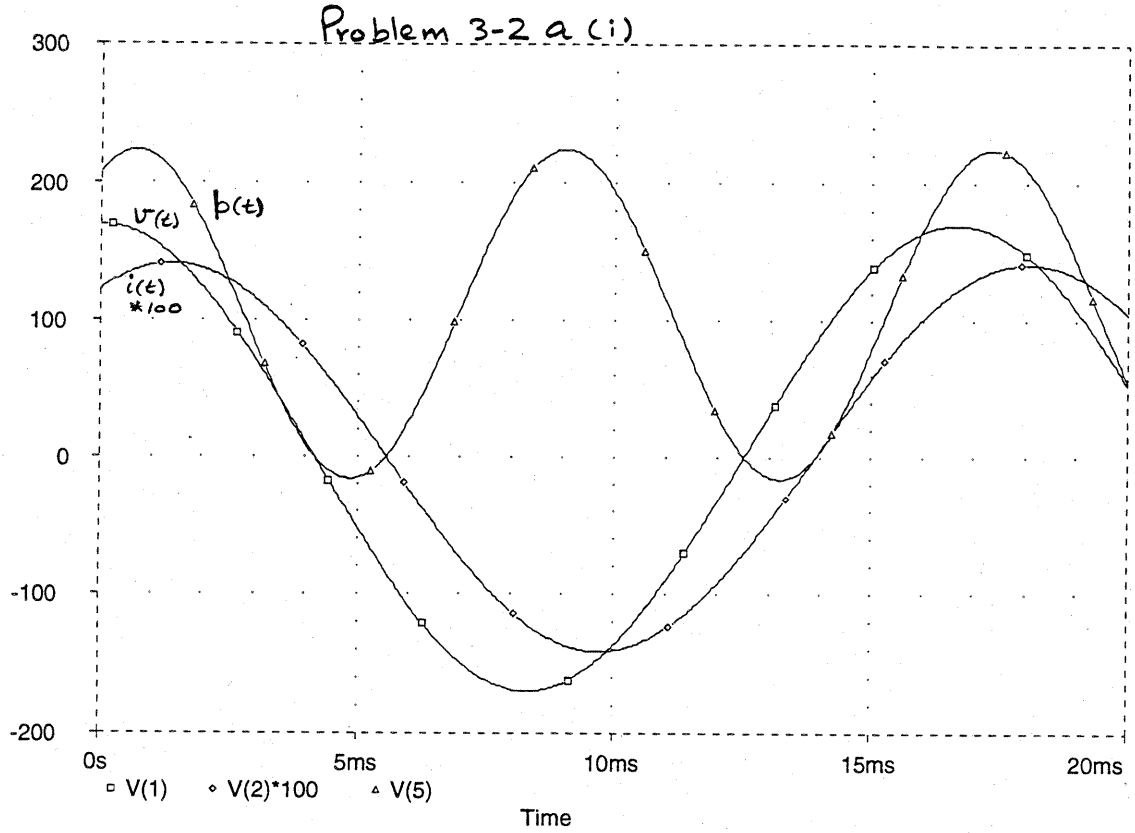
$p(t) = v(t) \cdot i(t)$

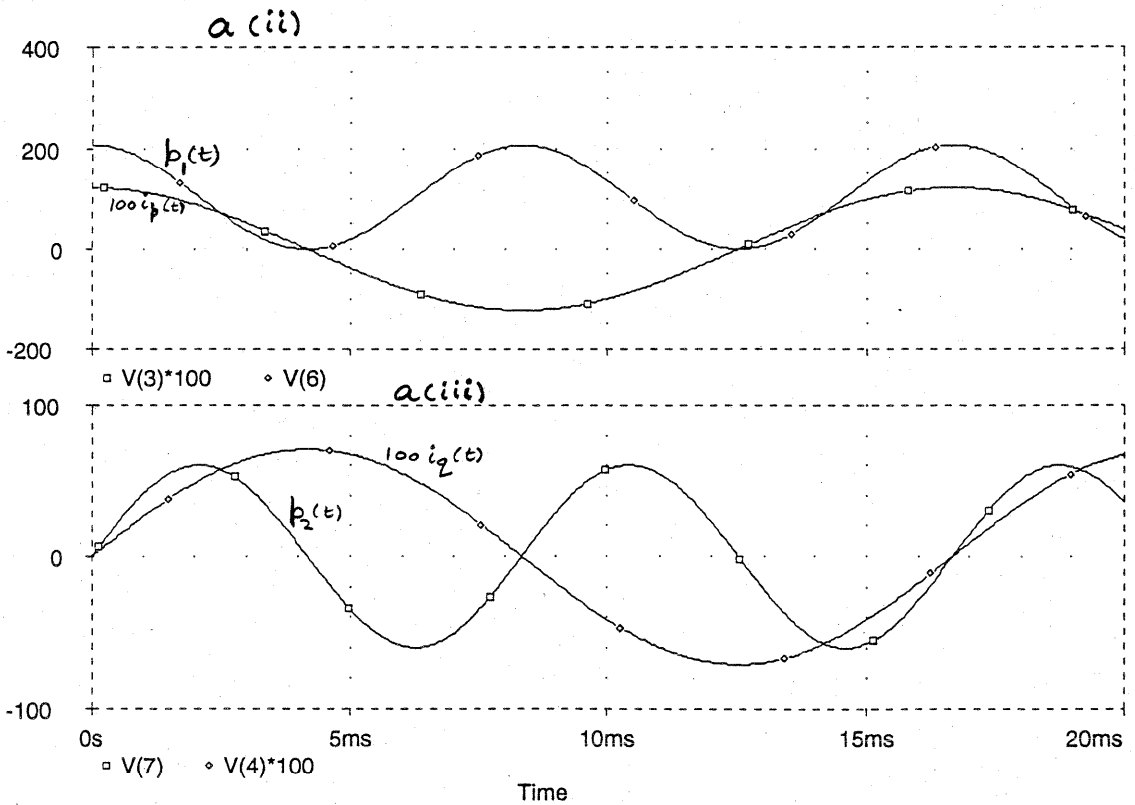
$i_p = (\sqrt{2}\, I \cos\phi) \cos \omega t$ Eq 3-12

$i_q = (\sqrt{2}\, I \sin\phi) \sin \omega t$ Eq 3-13

$p_1 = v \cdot i_p$

$p_2 = v \cdot i_q$


Problem 3-2 a (i)
300
200
100
0
-100
-200
v(t)
p(t)
i(t)
*100
0s
5ms
10ms
15ms
20ms
V(1)
V(2)*100
V(5)
Time


a (ii)
400
200
0
-200
p1(t)
100 i1(t)
V(3)*100
V(6)
a(iii)
100
0
-100
100 iq(t)
p2(t)
0s
5ms
10ms
15ms
20ms
V(7)
V(4)*100
Time

(b) $P = VI\cos\phi = 120 \times 1 \times \cos 30^\circ = 103.92\ W$

(c) $Q = VI \sin\phi$ Eq 3-14

$= 120 \times 1 \times \sin 30^\circ$

$= 60\ VA$

Also from peak of $p_2(t)$ in part a(iii).

(d) $PF = \cos\phi = 0.866$ (Lagging)

The load is inductive and it draws positive vars from the source.