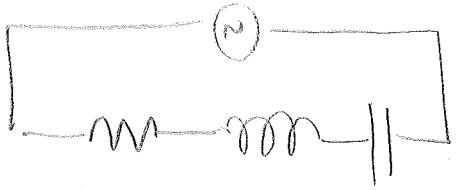
31.42.



	X_{200}	X_{1000}	
R	200	200	mΩ
L	80	400	mΩ
C	833	167	mΩ

$V = IX$.

$X_L = \omega L$

$X_C = \frac{1}{\omega C}$

$V_1 = V_R$

$V_2 = V_L$

$V_3 = V_C$

$V_4 = \vec{V}_L + \vec{V}_C$

$V_S = \text{EMF}$.

$V_{S\,RMS} = \frac{30}{\sqrt{2}}$ always

$= 21.2\ V$

at $\omega = 200\ s^{-1}$

$V_L = 80i$

$V_R = 200i$

$V_C = 833i$

$V_{TOT} = 30V$

$V_{TOT} = \left((833-80)^2 + 200^2\right)^{1/2} i$

$i = 38.5\ mA$.

$V_{1,RMS} = \frac{iR}{\sqrt{2}} = 5.44\ V$.

$V_{2,RMS} = \frac{iX_L}{\sqrt{2}} = 2.18V$

$V_{3,RMS} = \frac{iX_C}{\sqrt{2}} = 22.7V$

$V_{4,RMS} = \frac{i(833-80)}{\sqrt{2}} = 20.5V$

at $\omega = 1000\ s^{-1}$

$V_L = 400i$

$V_{TOT} = 30V$

$V_R = 200i$

$V_C = 167i$

$V_{TOT} = \left((400-167)^2 + 200^2\right)^{1/2} i$

$i = 98\ mA$.

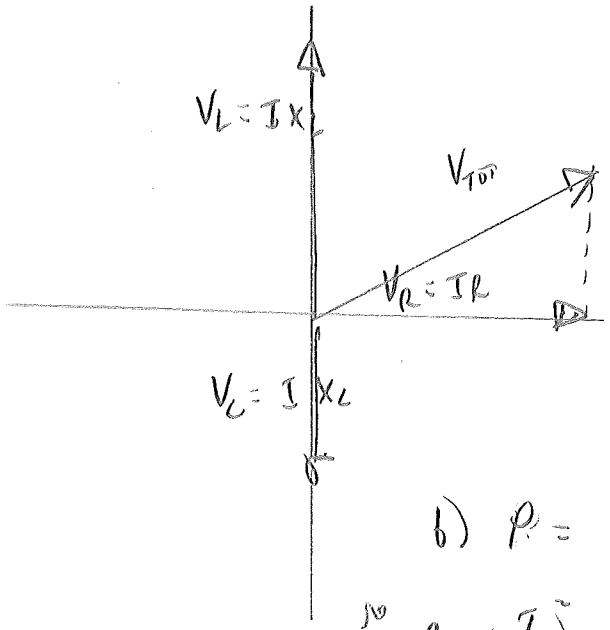
$V_{1,RMS} = \frac{iR}{\sqrt{2}} = 13.8\ V$.

$V_{2,RMS} = \frac{iX_L}{\sqrt{2}} = 27.7\ V$.

$V_{3,RMS} = 11.6\ V$.

$V_{4,RMS} = 16.1\ V$.

31.51. a)



$$V_{tot} = \left[(IX_L - IX_C)^2 + (IR)^2\right]^{1/2}$$

$$V_{tot} = I\left(X_L - X_C)^2 + R^2\right)^{1/2}$$

so $$I = \frac{V}{\sqrt{(X_L - X_C)^2 + R^2}}$$

Q.E.D. a),

$X_L = \omega L$

$X_C = \frac{1}{\omega C}$,

b) $P = I^2R$ where $I = I_{rms}$!

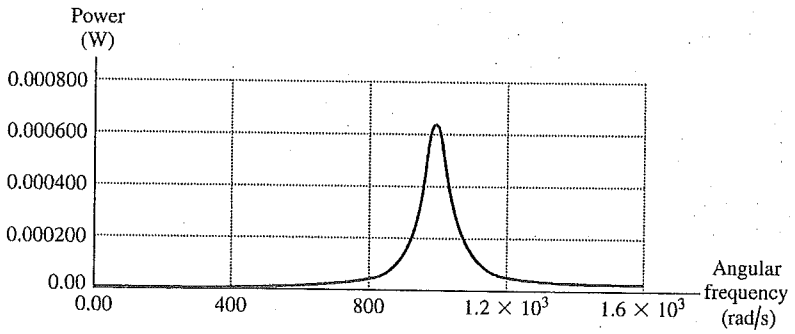
so $$P = \left(\frac{I}{\sqrt{2}}\right)^2 R = \frac{V^2 R/2}{R^2 + (X_L - X_C)^2}$$

c) Both maximize with smaller denominator, at $X_L = X_C$.

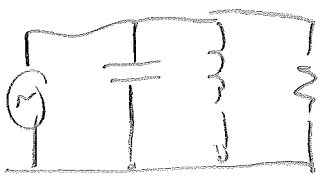
$\frac{1}{\omega C} = \omega L$ or $\omega = 1/\sqrt{LC}$

d)

(d) $$P_{av} = \frac{(100\text{ V})^2(200\,\Omega)/2}{(200\,\Omega)^2 + \left(\omega(2.00\text{ H}) - 1/[\omega(0.500\times10^{-6}\text{ F})]\right)^2} = \frac{25\omega^2}{40{,}000\omega^2 + \left(2\omega^2 - 2{,}000{,}000\right)^2}.$$



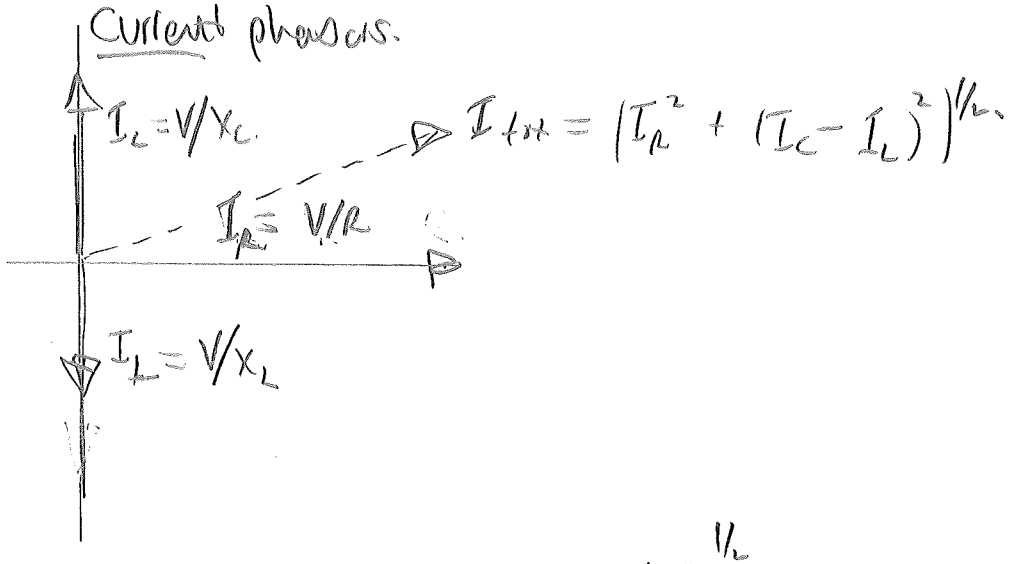
31.54.



in parallel $V_L = V_C = V_R = \mathcal{E}$

$I_L + I_C + I_R = I$

31.54 Continued (b, c)



(d) $$I_{tot} = \left[\frac{V^2}{R^2} + \left(\frac{V}{X_C} - \frac{V}{X_L}\right)^2\right]^{1/2}$$

$$= V \cdot \sqrt{\frac{1}{R^2} + \left(\omega C - \frac{1}{\omega L}\right)^2}$$