Example 1

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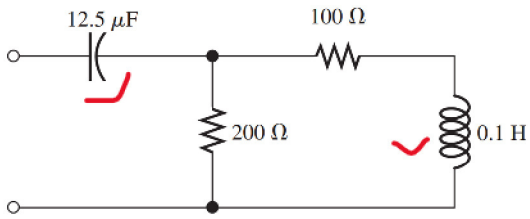
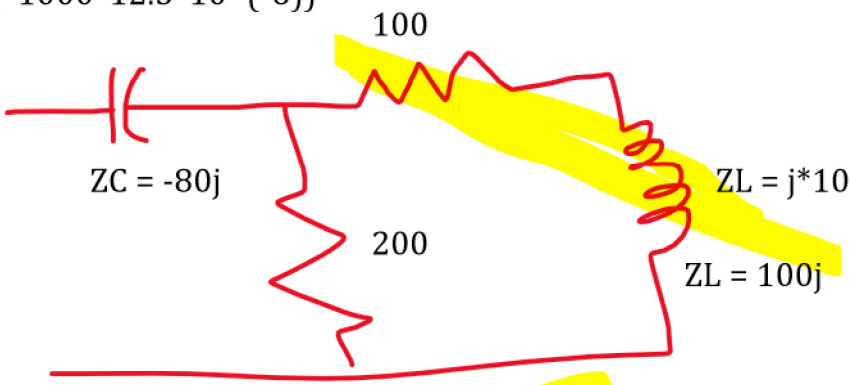


Determine the complex impedance between terminals shown in Figure for ω = 1000 rad/s

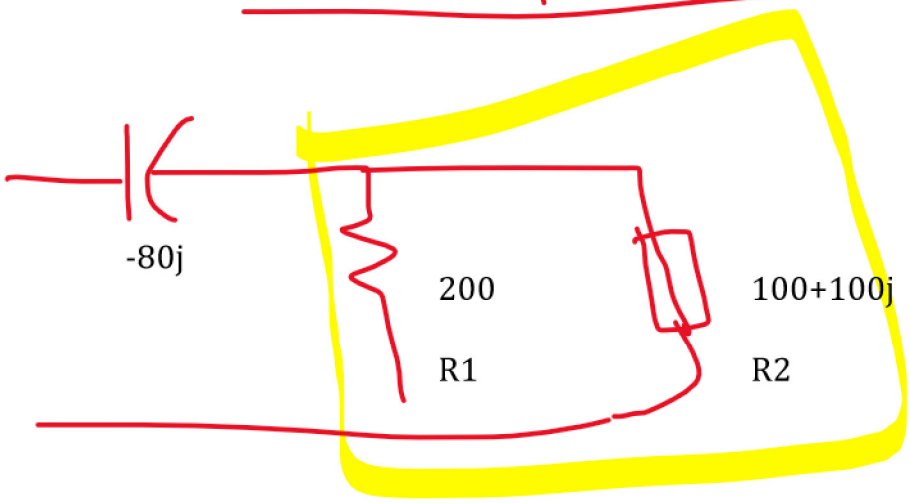
ZL = jwL

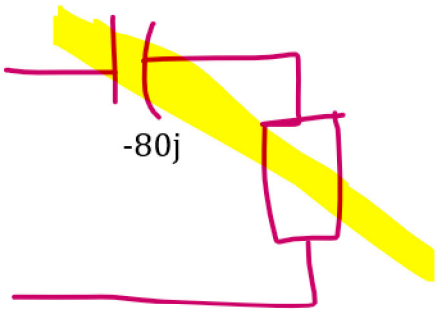
ZC = 1/(j*1000*12.5*10^(-6))

Zc = 1/(jwC)



80*j/j*j = 80j/(-1) = -80j





1/(1/R1 + 1/R2)

1/(1/200 + 1/(100+100j))
80+40j

1/(1/200 + 1/(100+100j)) = 80+40j

(80+40j) + (-80j) = 80-40j

Example 2

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V= Vm cos(wt+th)

Vm∠th

- A voltage vL(t) = 100 cos(200t) is applied to a 0.25-H inductance. (Notice that w = 200.)
- a. Find the impedance of the inductance, the phasor current, and the phasor voltage.
- b. Draw the phasor diagram.

Phasor Voltage (VL) = 100∠0 = 100 (cos(0)+j sin(0)) = 100 (1+0) = 100

Impedance of the inductance (ZL) = j*W*L = j*200*0.25 = 50j

Phasor Current (IL) = VL/ZL = 100/50j = 2/j = -2j

Complex to Phasor

A+Bj ----> Sqrt(A^2+B^2)∠ $\tan^{-1}\left(\frac{b}{a}\right)$

sqrt(0^2+(-2)^2)∠ $\tan^{-1}(-\frac{2}{0})$ = 2∠90

Example 3

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- A voltage vC(t) = 100 cos(200t) is applied to a 100μF capacitance.
- a. Find the impedance of the capacitance, the phasor current, and the phasor voltage.
- b. Draw the phasor diagram.

ZC=1/(jwc)

Vc = Zc * Ic

Example 4

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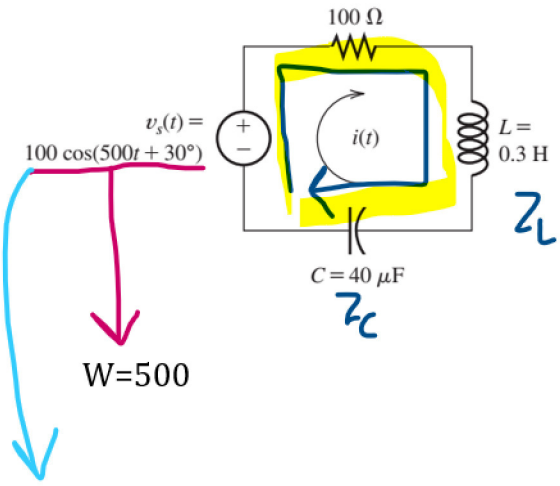
- Find the steady-state current for the circuit shown in Figure. Also, find the phasor voltage across each element and construct a phasor diagram.



Step 1: Convert the values to Complex Impedances

R = 100

L =0.3 H ----> ZL = j*500*0.3 = 150j

C = 40*10^-6 ---> ZC = 1/(j*500*40*10^-6) = -50j

W=500

100∠30 Phasor Form

Complex Form
100 (cos (30)+j sin(30))

Loop

-vs + 100*i + (150j * i) + (-50j * i) = 0

Vs = I (100+150j-50j)

I =

Vr = R * I

VL = Zl * I

Vc = Zc * I