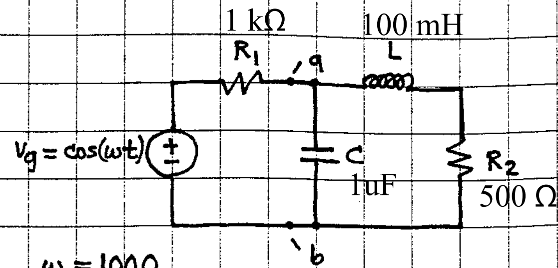
ex:



$\omega = 1000$

Draw a diagram of the frequency-domain representation of the circuit shown.

sol'n: We must: 1) Write sources as phasors
2) Write R, L, C's as complex impedances

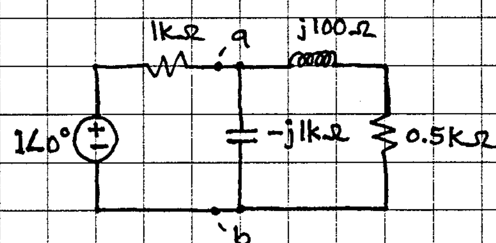
Impedances: $Z_R = R$ $\quad Z_L = j\omega L$ $\quad Z_C = \dfrac{1}{j\omega C} = \dfrac{-j}{\omega C}$

$j\omega L = j \cdot 1000 \cdot 0.1 = j100\,\Omega$

$\dfrac{1}{j\omega C} = \dfrac{-j}{1000 \cdot 10^{-6}} = -j\,1k\Omega$

R's are just the given R values.

$\mathcal{P}\{v_g\} \equiv$ phasor for source $= \mathcal{P}\{\cos(\omega t)\} = 1e^{j0} = 1\angle 0°$



Find an equivalent impedance at the points a-b looking to the right, and specify the resistance (i.e. real part) and reactance (i.e. imaginary part) of this impedance.

$Z_{ab} = Z_C \| (Z_L + Z_R) = -j1k\Omega \| (j\,0.1k\Omega + 0.5k\Omega)$

$= 1k\Omega \cdot \; -j \| (j\,0.1 + 0.5)$

$$z_{ab} = 1k\Omega \cdot \frac{-j \cdot (j0.1 + 0.5)}{-j + j0.1 + 0.5}$$

$$= 1k\Omega \cdot \frac{0.1 - j0.5}{0.5 - j0.9}$$

$$= 1k\Omega \cdot \frac{0.1 - j0.5}{0.5 - j0.9} \, \frac{0.5 + j0.9}{0.5 + j0.9}$$

$$= 1k\Omega \cdot \frac{(0.1)(0.5) - (-0.5)(0.9) + j[(0.1)(0.9) + (-0.5)(0.5)]}{0.5^2 + 0.9^2}$$

$$= 1k\Omega \cdot \frac{0.05 + 0.45 + j(0.09 - 0.25)}{0.25 + 0.81}$$

$$= 1k\Omega \cdot \frac{0.5 - j\,0.16}{1.06}$$

$$= 1k\Omega \cdot 0.47 - j\,0.15$$

$$z_{ab} = 0.47\,k\Omega - j\,0.15\,k\Omega$$

(resistance: $0.47\,k\Omega$; reactance: $0.15\,k\Omega$)