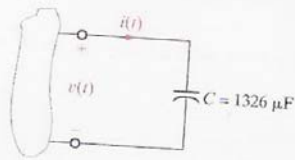


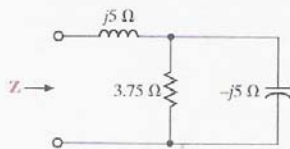
EEE302: Electrical Networks II

Instructor: Dragica Vasileska  
 HW1 due: Friday, September 3<sup>rd</sup>

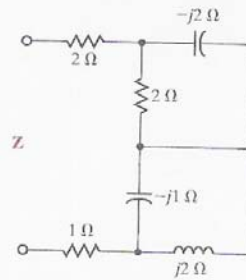
1. Calculate the current in the capacitor if the voltage input is  $v(t) = 16\cos(377t - 22^\circ)$ . Give the answer in both the time and the frequency domain.



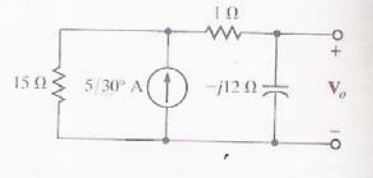
2. Find the frequency-domain impedance  $Z$  shown in the circuit below.



3. Find  $Z$  in the network.

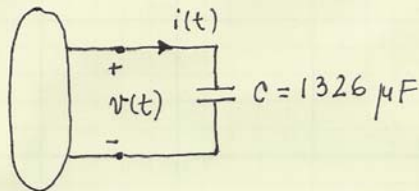


4. Find the frequency-domain voltage  $V_o$ , as shown in the figure below.



## Solution to HW #1

- ① Calculate the current in the capacitor if the voltage input is  $v(t) = 16 \cos(377t - 22^\circ)$ . Give the answer in both the time and the frequency domain.



$$v(t) = 16 \cos(377t - 22^\circ)$$

$$V = 16 \angle -22^\circ, \quad \omega = 377 \text{ rad/s}$$

$$i = C \frac{dv}{dt} \Rightarrow I = j\omega C V$$

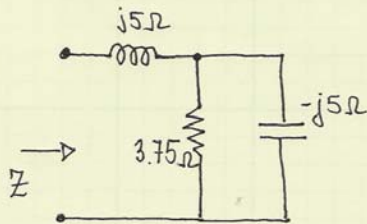
$$I = j 377 \times 1326 \times 10^{-6} \times 16 \angle -22^\circ$$

$$I = j 7.998 \angle -22^\circ = 7.998 \angle 90 - 22^\circ$$

$$I \approx 8 \angle 68^\circ \text{ (A)}$$

$$i(t) = 8 \cos(377t + 68^\circ)$$

- ② Find the frequency-domain impedance  $Z$  shown in the circuit below.



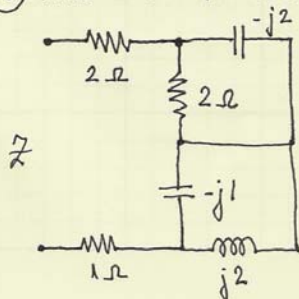
$$Z = j5 + \frac{3.75(-j5)}{3.75 - j5}$$

$$= \frac{j5 \cdot 3.75 + 25 - j5 \cdot 3.75}{3.75 - j5}$$

$$= \frac{25}{3.75 - j5} = \frac{25}{6.25 \angle -53.1^\circ}$$

$$Z = 4 \angle 53^\circ$$

- ③ Find  $Z$  in the network!

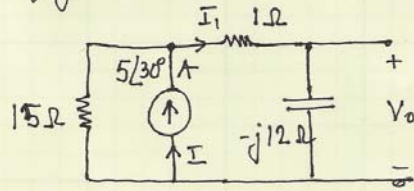


$$Z = 2 + \frac{2(-j2)}{2 - j2} + \frac{(-j1)(j2)}{-j1 + j2} + 1$$

$$= 2 - \frac{j2(1+j)}{2} + j2 + 1$$

$$= 2 - j + 1 - j2 + 1 = 4 - j3$$

④ Find the frequency-domain voltage  $V_o$ , as shown in the figure below.



$$I = 5 \angle 30^\circ$$

using current division:

$$I_1 = I \frac{15}{1 - j12}$$

$$V_o = -j12 I_1 = \frac{-j12 \times 15 \times 5 \angle 30^\circ}{1 - j12} =$$

$$= \frac{.900 \angle -60^\circ}{12.04 \angle -85.24^\circ} = 7.5 \angle 25.24^\circ$$