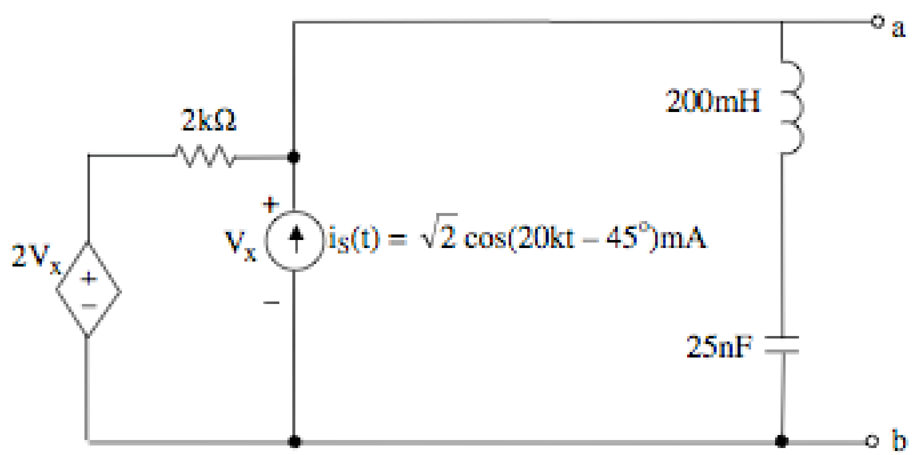
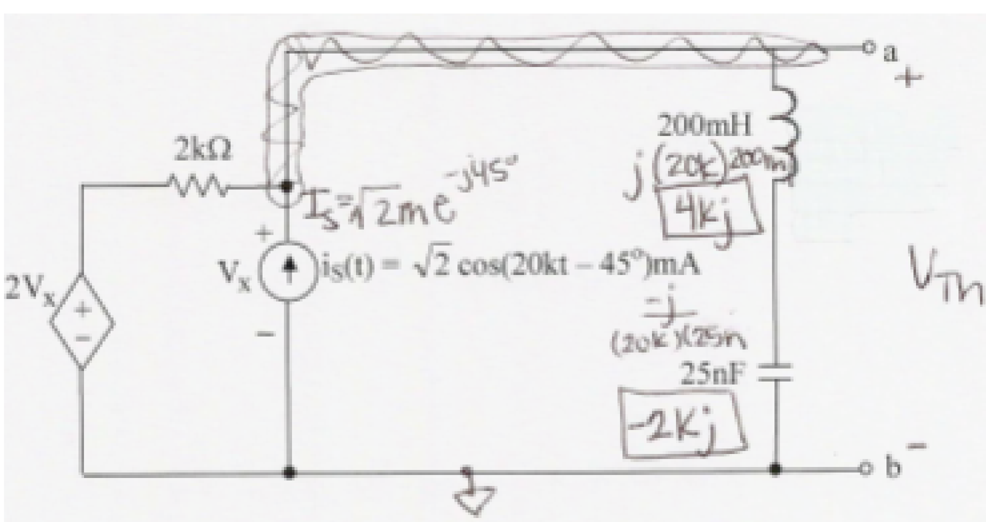
Ex:



a) Draw a frequency-domain equivalent of the above circuit. Show a numerical phasor value for $i_S(t)$, and show numerical impedance values for R, L, and C. Label the dependent source appropriately.

b) Find the Thevenin equivalent (in the frequency domain) for the above circuit. Give the numerical phasor value for $\mathbf{V}_{Th}$ and the numerical value for the impedance value of z_{Th}.

SOL'N:



① Find V_{Th}:

$$V_{Th} = V_x$$

Using node-voltage:

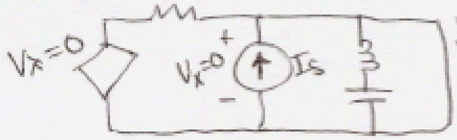
$$\frac{V_{Th} - 2V_{Th}}{2k} + \frac{V_{Th}}{(4kj - 2kj)} - \sqrt{2}me^{-j45^\circ} = 0$$

$$V_{Th}\left(\frac{j}{2kj} - \frac{2j}{2kj} + \frac{1}{2kj}\right) = \sqrt{2}me^{-j45^\circ}$$

$$V_{Th}\left(\frac{1-j}{2kj}\right) = \frac{\sqrt{2}me^{-j45^\circ}\cdot(2ke^{j90^\circ})}{(1-j)} = \frac{\sqrt{2}m(2k)e^{j45^\circ}}{\sqrt{2}e^{-j45^\circ}}$$

$$\boxed{V_{Th} = 2e^{j90^\circ}}$$

② Find Z_{Th}:



$\downarrow I_{sc} = I_s$

$$\therefore Z_{Th} = \frac{V_{Th}}{I_{sc}} = \frac{2e^{j90^\circ}}{\sqrt{2}me^{-j45^\circ}}$$

$$\boxed{Z_{Th} = \frac{2K}{\sqrt{2}}e^{j135^\circ}}$$