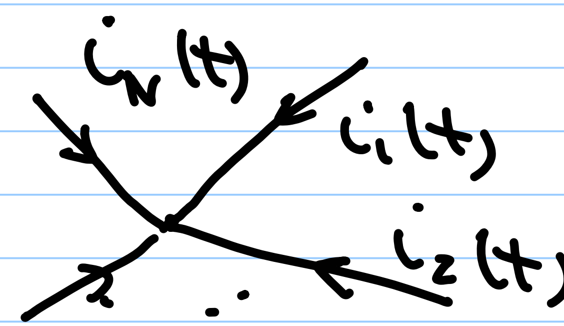
Lecture 25

From sections 8.7, 8.8 of text

Solve E8.12 - E8.15, 8.37, 8.40,
8.43, 8.46, 8.49, 8.52, 8.54, 8.72,
8.87, 8.90

KCL for phasors



$$i_1(t) + i_2(t) + \cdots + i_N(t) = 0$$

$$Re\left(\bar{I}_1 e^{j\omega t}\right) + Re\left(\bar{I}_2 e^{j\omega t}\right) + \cdots + \cdots + Re\left(\bar{I}_N e^{j\omega t}\right) = 0$$

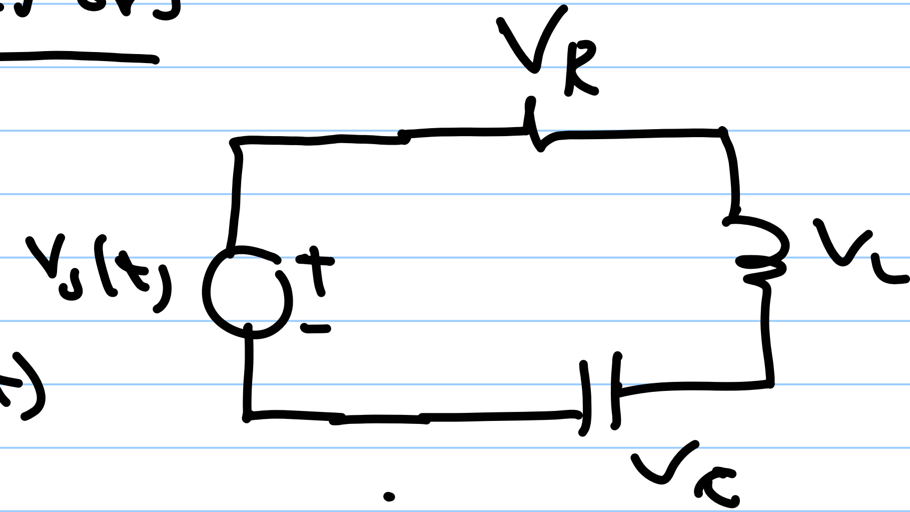
which implies that

$$\bar{I}_1 e^{j\omega t} + \bar{I}_2 e^{j\omega t} + \cdots + \bar{I}_N e^{j\omega t} = 0$$

$$\Rightarrow \boxed{\bar{I}_1 + \bar{I}_2 + \cdots + \bar{I}_N = 0}$$

KVL for phasors

$$v_s(t) = v_R(t) + v_L(t) + v_C(t)$$



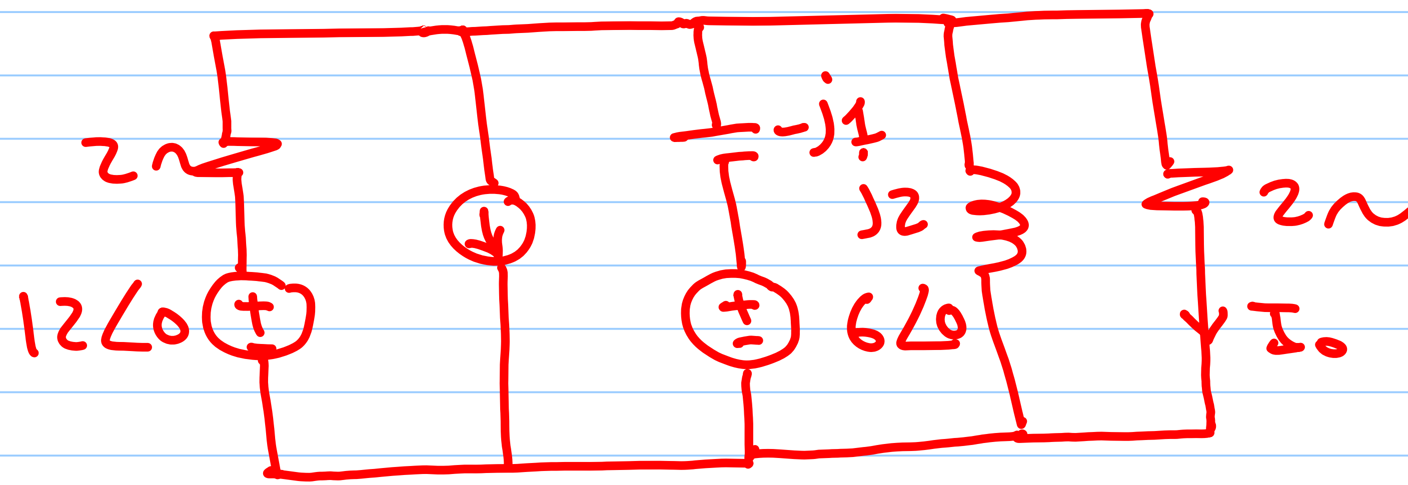
$$\mathrm{Re}(\bar{V}_s e^{j\omega t}) = \mathrm{Re}(\bar{V}_R e^{j\omega t}) + \mathrm{Re}(\bar{V}_L e^{j\omega t}) + \mathrm{Re}(\bar{V}_C e^{j\omega t})$$

which implies that

$$\bar{V}_s e^{j\omega t} = \bar{V}_R e^{j\omega t} + \bar{V}_L e^{j\omega t} + \bar{V}_C e^{j\omega t}$$

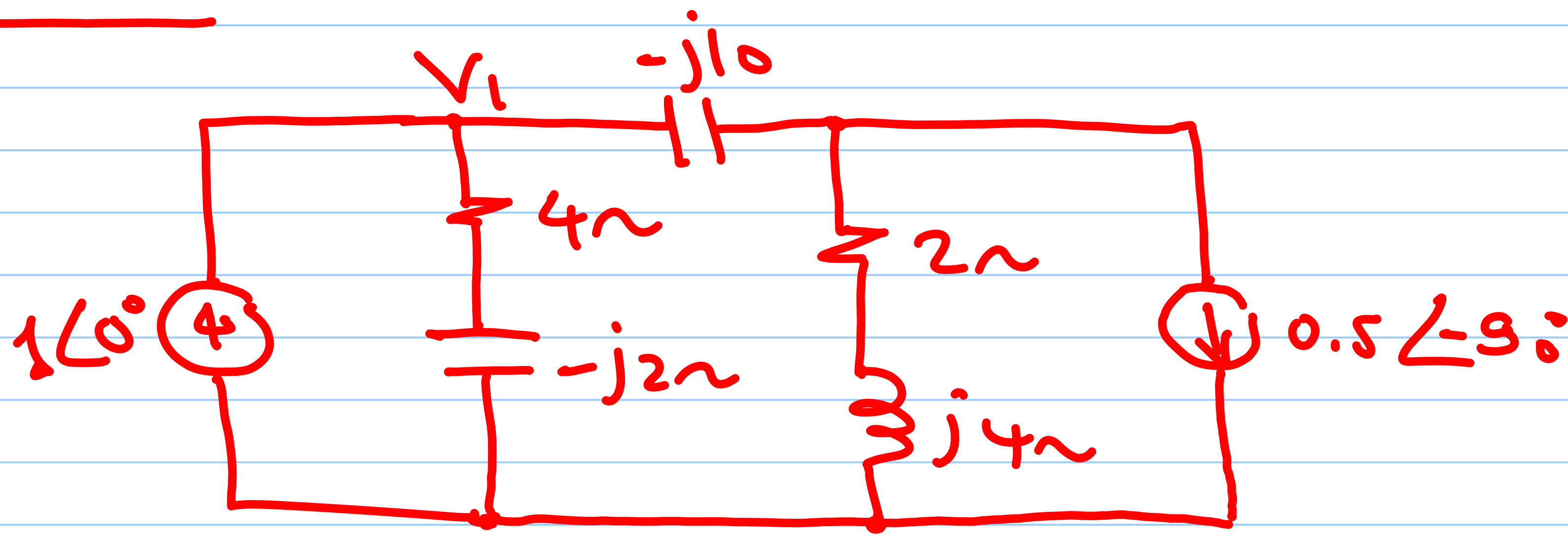
$$\Rightarrow \boxed{\bar{V}_s = \bar{V}_R + \bar{V}_L + \bar{V}_C}$$

Example



Find the Current I_o Using Nodal analysis. Verify your answer using superposition.

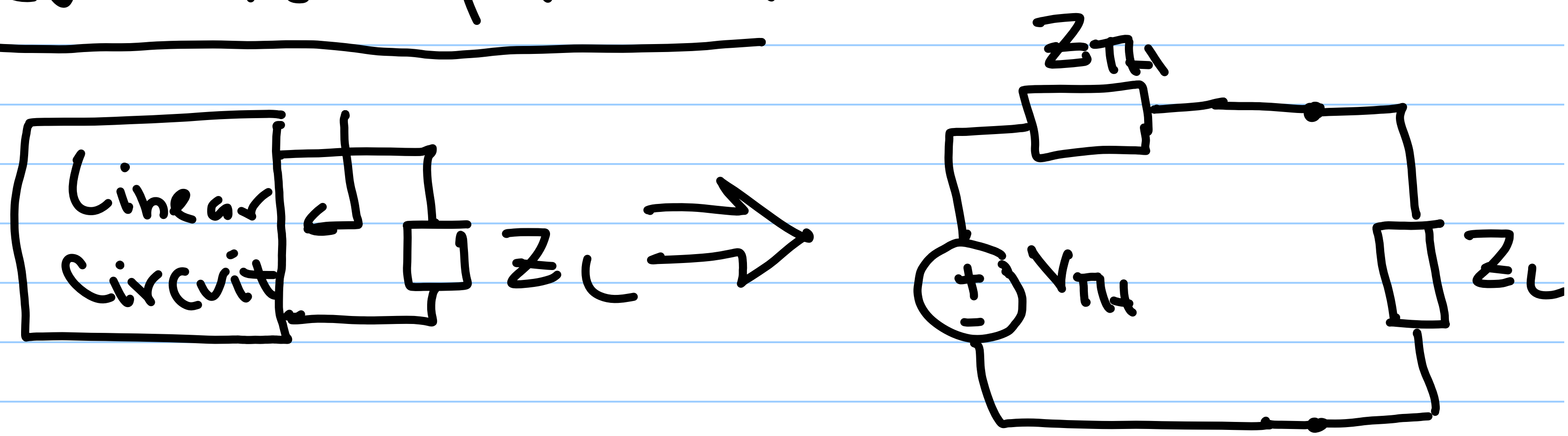
Example



Determine V_1 using superposition.
Verify your answer using loop analysis.

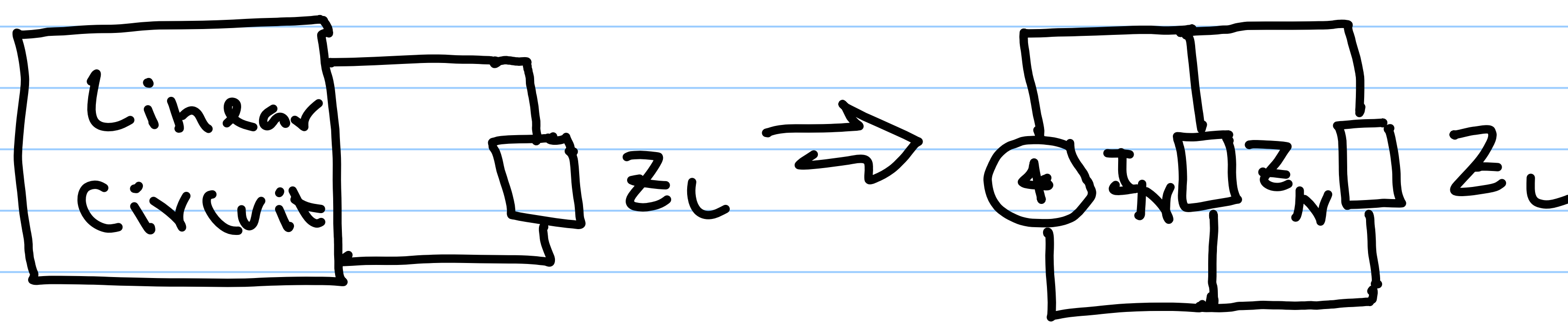
Thevenin's Equivalent

*



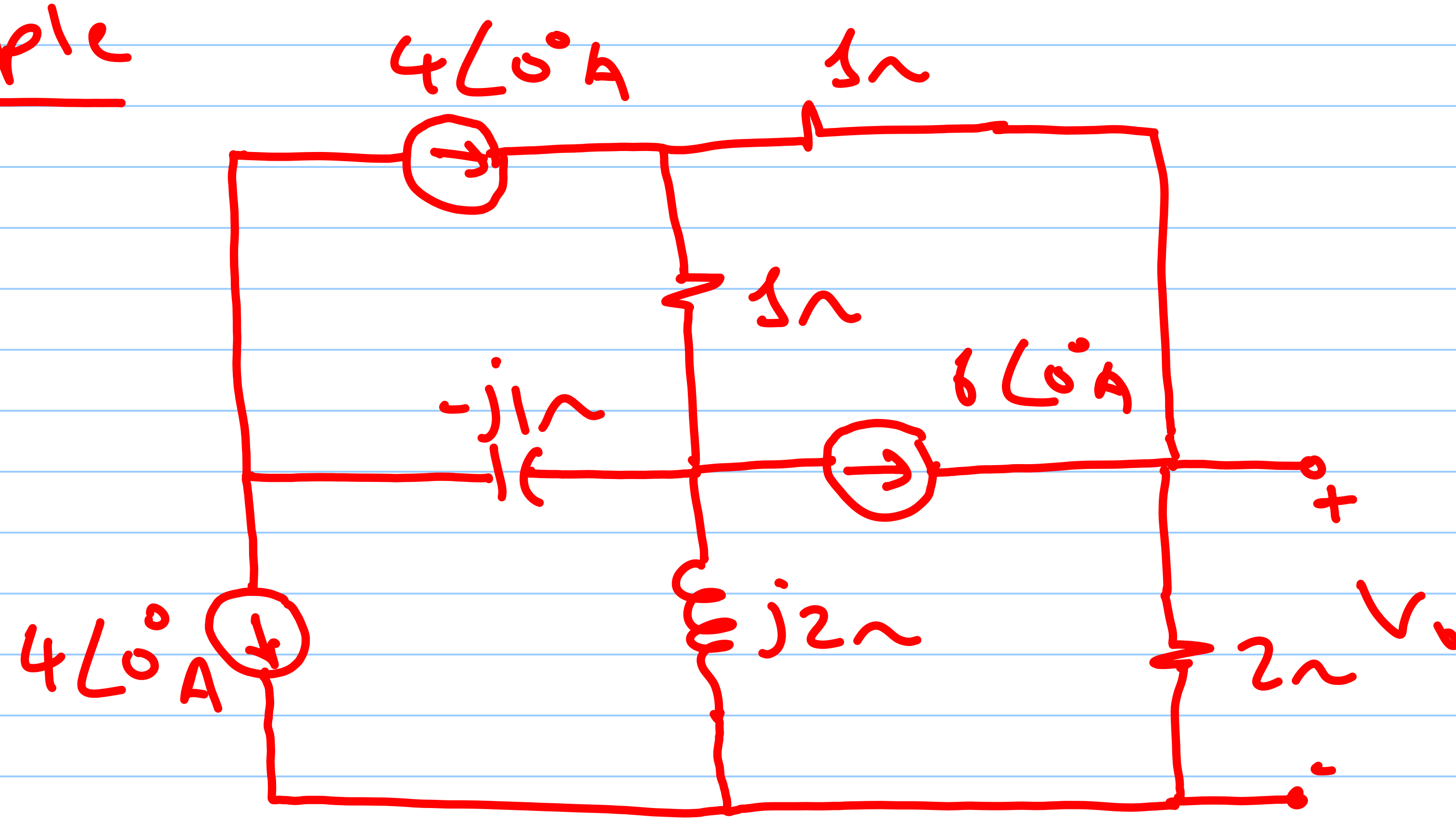
* Any linear network can be replaced by complex Thevenin's for AC Analysis
* Note that V_{TH} & Z_{TH} are complex quantities

Norton Equivalent



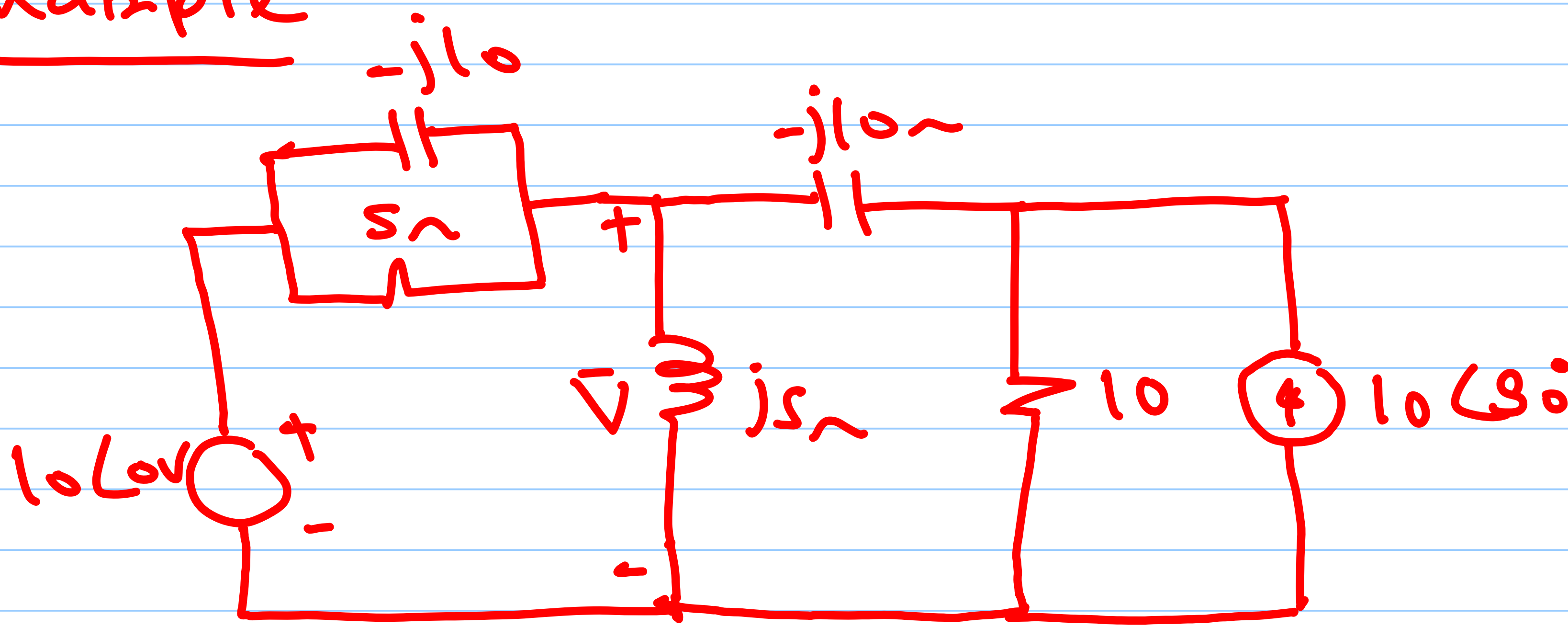
* Notice that I_N and Z_N are complex quantities

Example



Find V_o using Thévenin's theorem

Example



The shown circuit operater at 1 MHz.

Find $v(t)$ using Norton's Theorem