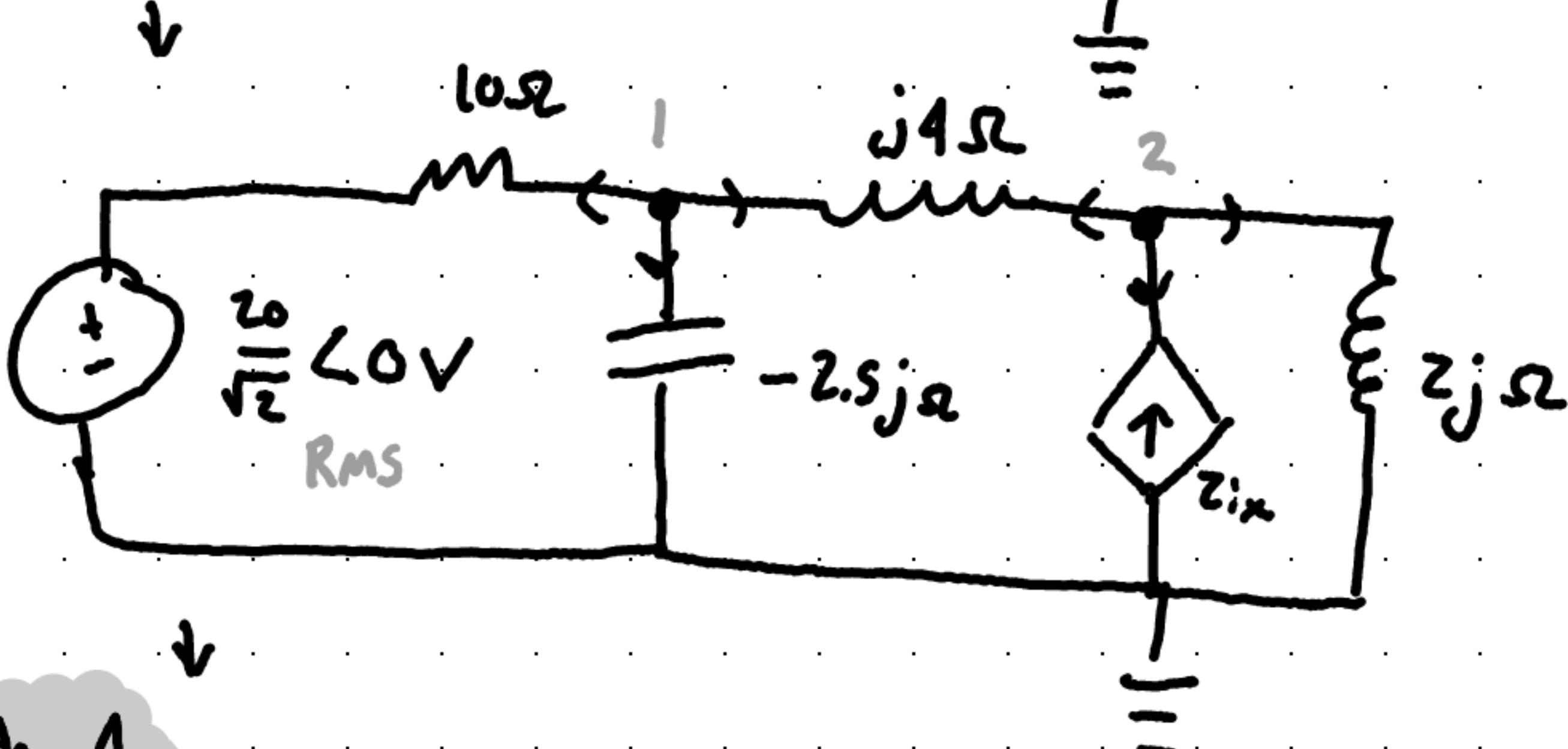
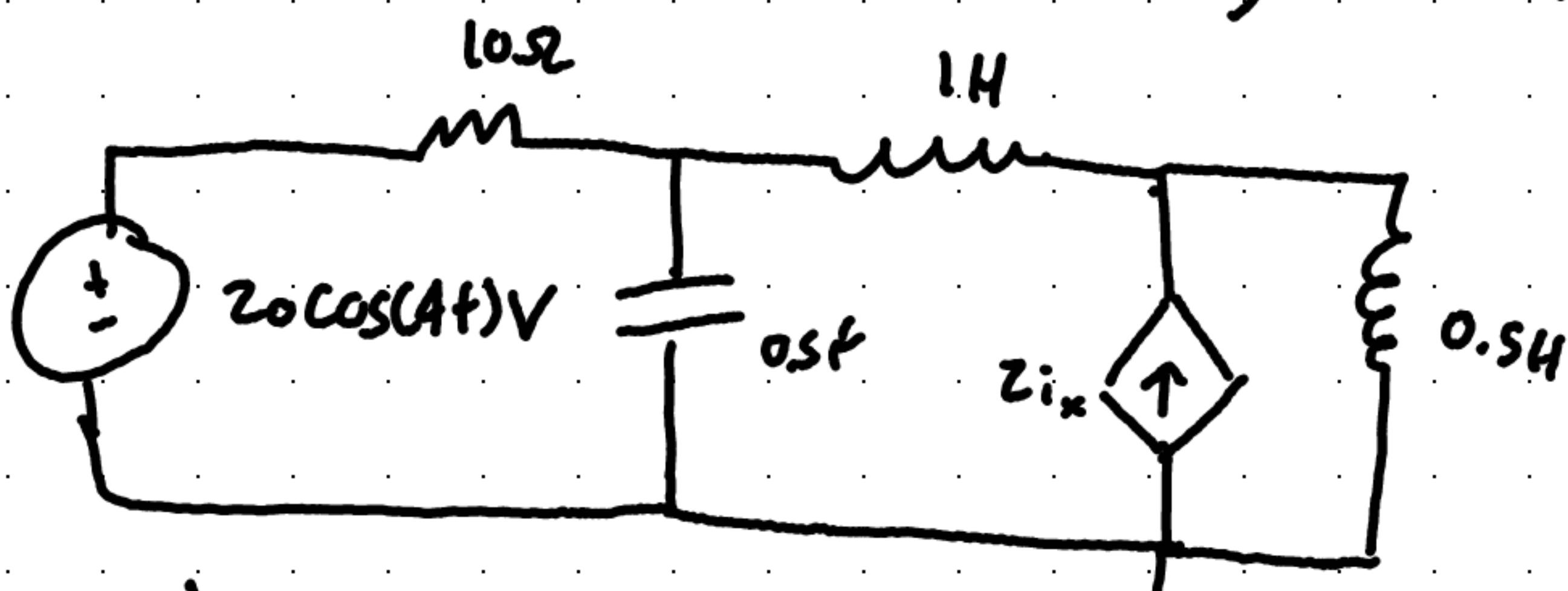


## Nodal Analysis in Ac:

Find  $I_x$  in the circuit by using nodal analysis



### Node 1

$$\frac{V_1 - \frac{z_0}{\sqrt{2}} < 0}{10} + \frac{V_1}{-2.5j} + \frac{V_1 - V_2}{4j} = 0$$

$$I_x = \frac{V_1}{-2.5j}$$

### Node 2

$$\frac{V_2 - V_1}{4j} + \frac{V_2}{2j} - 2\left(\frac{V_1}{-2.5j}\right) = 0$$

$$(1 + 1.5j)V_1 + 2.5jV_2 = \frac{20}{\sqrt{2}} \angle 0^\circ V$$
Eqn 1

$$-V_1 - 8j\left(\frac{V_1}{-25j}\right) + 3V_2 = 0$$
Eqn 2

$$\begin{bmatrix} 1 + 1.5j & 2.5j \\ 2.2 & 3 \end{bmatrix} \begin{bmatrix} V_1 \\ V_2 \end{bmatrix} = \begin{bmatrix} \frac{20}{\sqrt{2}} \angle 0^\circ V \\ 0 \end{bmatrix}$$

Cramer's Rule

$$V_1 = \frac{D_1}{D} \quad V_2 = \frac{D_2}{D} \quad \leftarrow \text{Determinant}$$

$$D_1 = \begin{bmatrix} \frac{20}{\sqrt{2}} \angle 0^\circ & 2.5j \\ 0 & 3 \end{bmatrix} =$$

Solve, on  
fill in

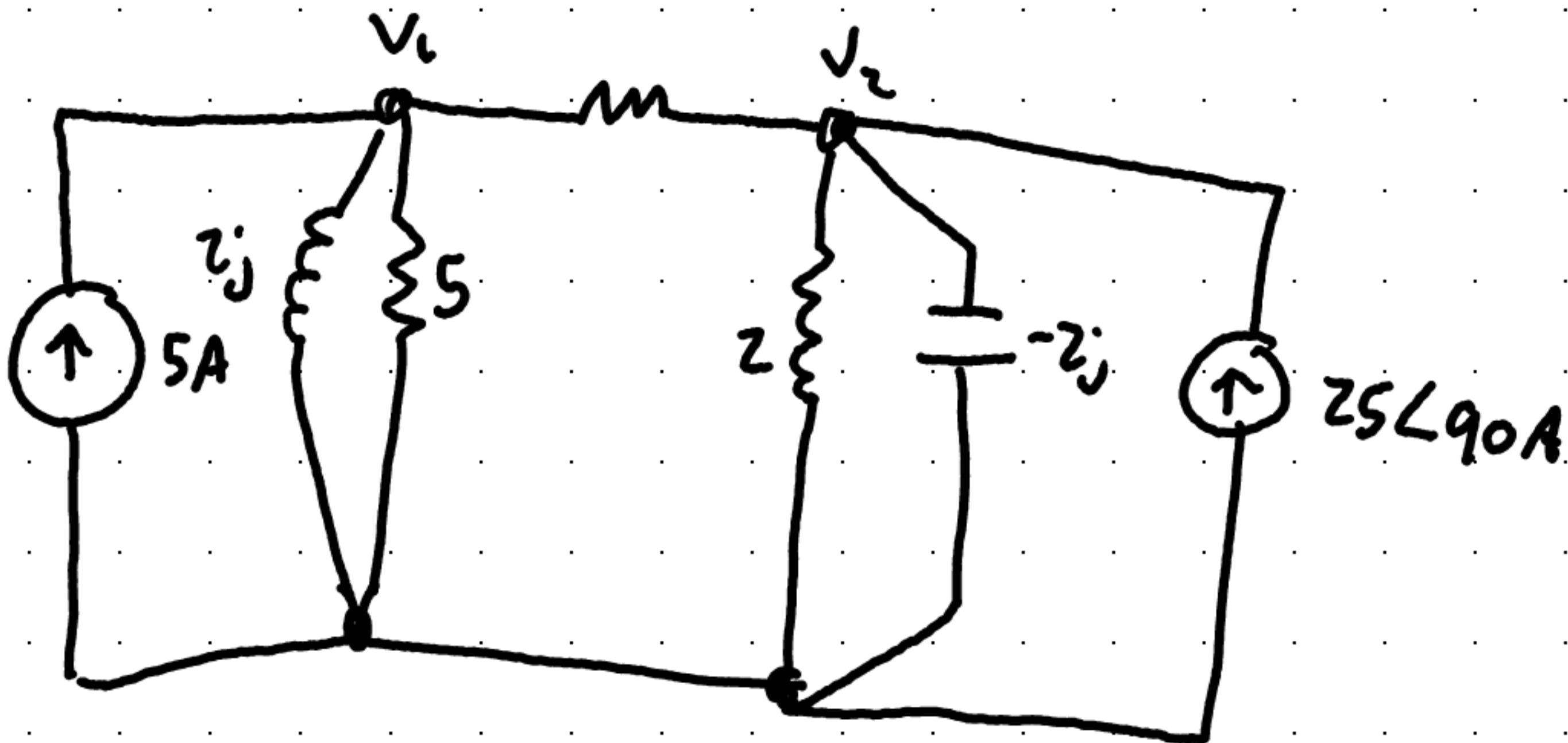
$$D_2 = \begin{bmatrix} 1 + 1.5j & \frac{20}{\sqrt{2}} \angle 0^\circ \\ 2.2 & 0 \end{bmatrix} =$$

Remember to  
Convert back  
to time  
domain.

$$D = 3 - j$$

## Nodal Matrix by inspection

- Load into matrix by Admittance



$$A \begin{bmatrix} \frac{1}{5} + \frac{1}{4} + \frac{1}{j2} & -\frac{1}{4} \\ -\frac{1}{4} & \frac{1}{2} + \frac{1}{4} + \frac{1}{-j2} \end{bmatrix} \begin{bmatrix} V_1 \\ V_2 \end{bmatrix} = \begin{bmatrix} 5 \\ 25\angle 90 \end{bmatrix}$$

Can use Cramer's Rule to solve this, just as before.

## Thev & Norton

- Replace Voltage Sources with Short Circuits, and Current Sources with Open Circuits