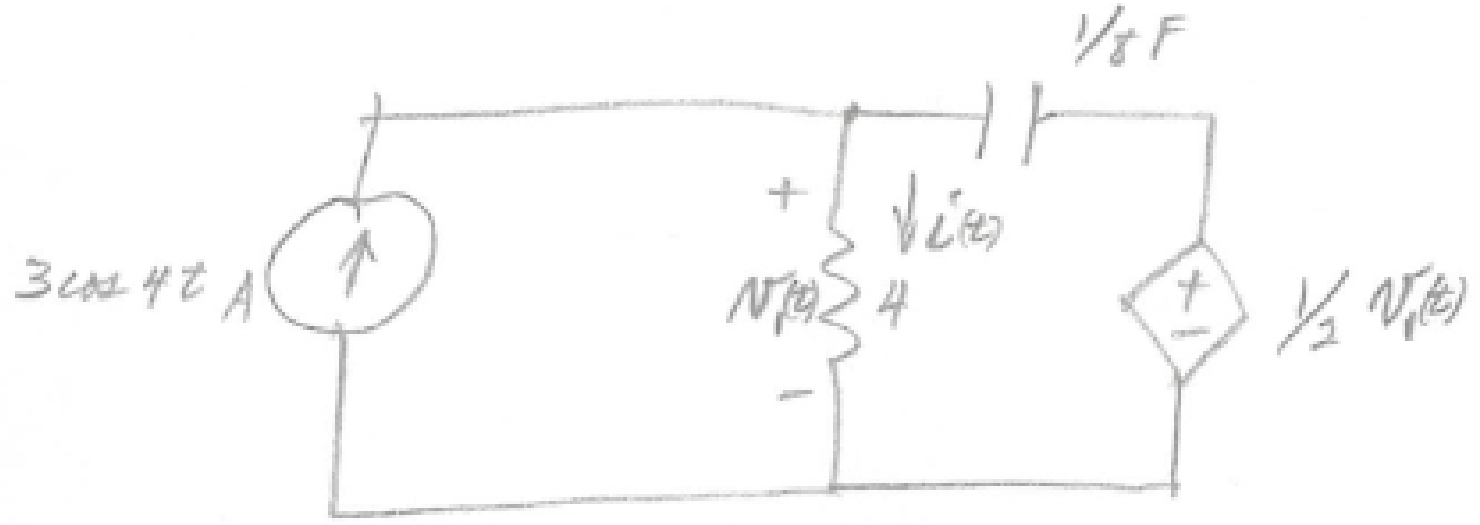
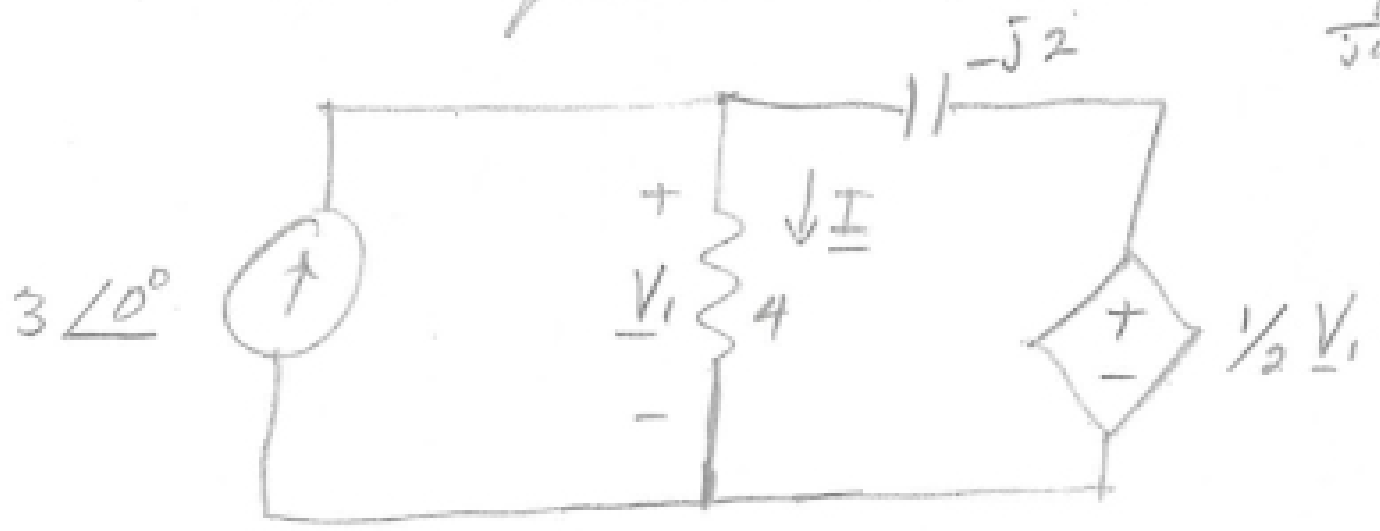
Circuits with dependent sources



find $i(t)$:

a) Get phasor circuit

$\frac{1}{j\omega C} = \frac{1}{j(4)\frac{1}{8}} = -j2$



KCL: $-3\angle 0 + \underline{I} + \frac{\underline{V}_1 - \frac{1}{2}\underline{V}_1}{-j2} = 0$

also $\underline{V}_1 = 4\underline{I}$

$\therefore \quad \underline{I} + \frac{2\underline{I}}{-j2} = 3\angle 0°$

$(1 + j1)\,\underline{I} = 3\angle 0°$

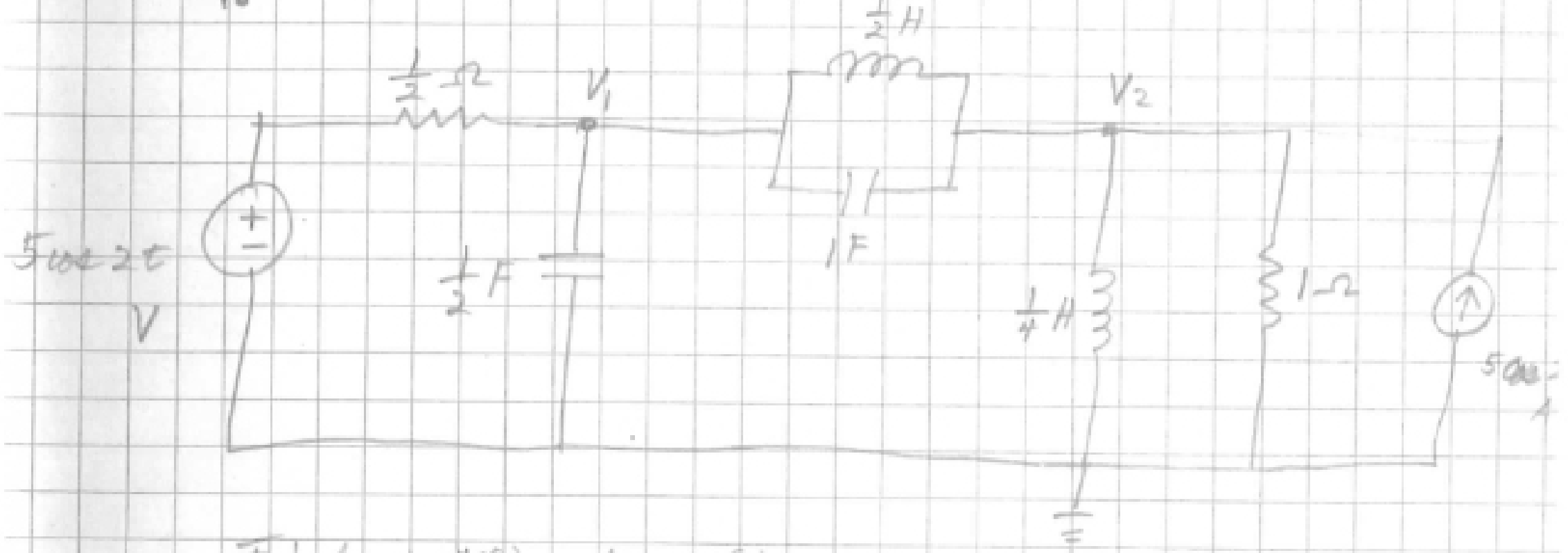
$\underline{I} = \frac{3\angle 0°}{\sqrt{2}\angle 45°} = \frac{3}{\sqrt{2}}\angle -45°$

$\therefore \quad i(t) = \frac{3}{\sqrt{2}}\cos(4t - 45°) \ A$

11.1

Example of model analysis

1.



Find $v_1(t)$ and $v_2(t)$

$\omega = 2$ a) Go to the phasor circuit

b) Simplify

@ 1!

$$\frac{\underline{V}_1 - 5}{1/2} + \frac{\underline{V}_1}{-j1} + \frac{\underline{V}_1 - \underline{V}_2}{j1} + \frac{\underline{V}_1 - \underline{V}_2}{-j\,1/2} = 0$$

@ 2: $\frac{\underline{V}_2 - \underline{V}_1}{j1} + \frac{\underline{V}_2 - \underline{V}_1}{-j\,1/2} + \frac{\underline{V}_2}{j\,1/2} + \frac{\underline{V}_2}{1} - 5 = 0$

Simplify

$$2\underline{V}_1 - 10 + j\underline{V}_1 - j\underline{V}_1 + j\underline{V}_2 + j2\underline{V}_1 - j2\underline{V}_2 = 0$$

$$-j\underline{V}_2 + j\underline{V}_1 + j2\underline{V}_2 - j2\underline{V}_1 - j2\underline{V}_2 + \underline{V}_2 - 5 = 0$$

$$\begin{bmatrix} 2+j2 & -j1 \\ -j1 & 1-j1 \end{bmatrix} \begin{bmatrix} \underline{V}_1 \\ \underline{V}_2 \end{bmatrix} = \begin{bmatrix} 10 \\ 5 \end{bmatrix}$$