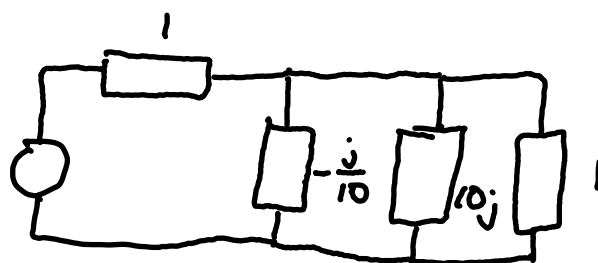
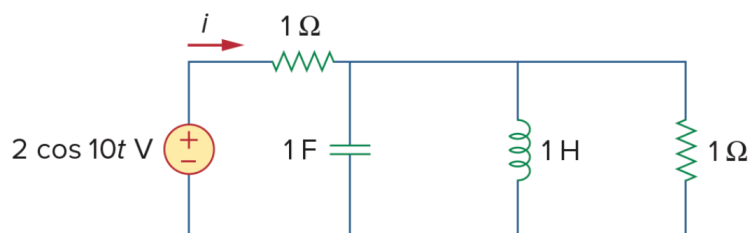


# Homework 6

Due: Friday, March 10th, 2023 by 7PM.

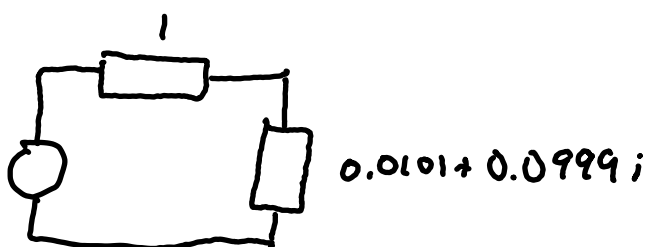
Note: In order to receive full credit, you must show your work and carefully justify your answers. The correct answer without any work will receive little or no credit.

1. Find  $i(t)$ .

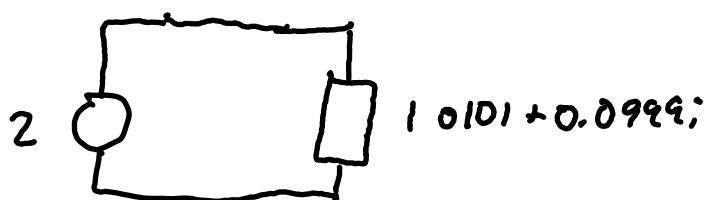


$$\frac{(-\frac{j}{10})(j10)}{-\frac{j}{10} + j10 + 1} =$$

$$0.0101 + 0.0999j$$



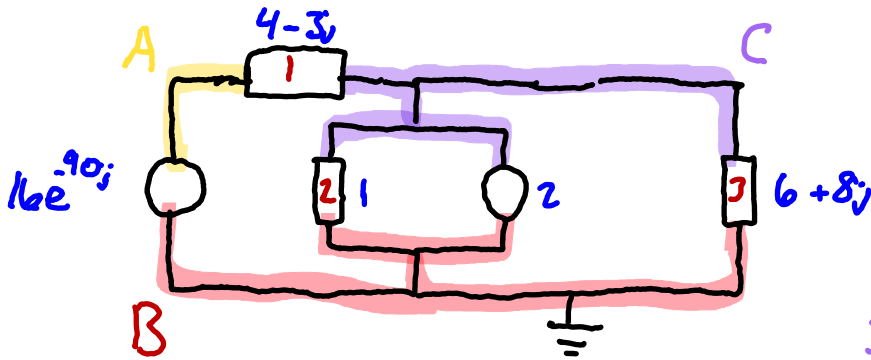
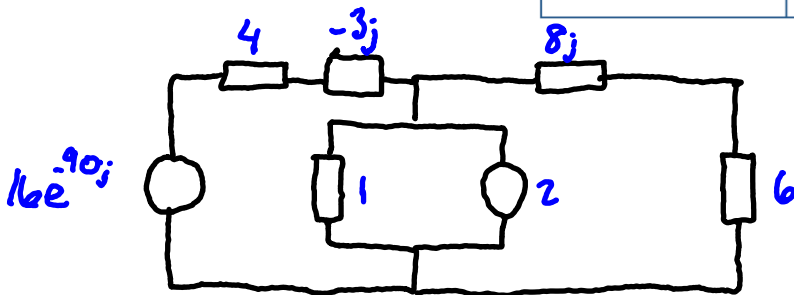
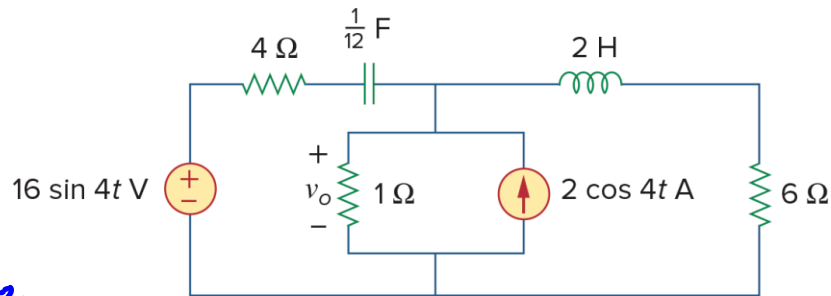
$$0.0101 + 0.0999j$$



$$0.0101 + 0.0999j$$

$$i = \frac{V}{Z} = \frac{2}{0.0101 + 0.0999j} = 1.961 + 0.194j$$

$$i(t) = 1.97e^{5.65j}$$

2. Find  $v_o(t)$ .

$$I = \frac{V}{Z}$$

$$A = 16e^{-90j}$$

$$B = 0$$

KCL @ C:

$$I_1 + 2 = I_2 + I_3$$

$$V_1 = 16e^{-90j} - C$$

$$\frac{V_1}{4-3j} + 2 = V_2 + \frac{V_3}{6+8j}$$

$$V_2 = C$$

$$V_3 = C$$

$$\frac{16e^{-90j} - C}{4-3j} + 2 = C + \frac{C}{6+8j}$$

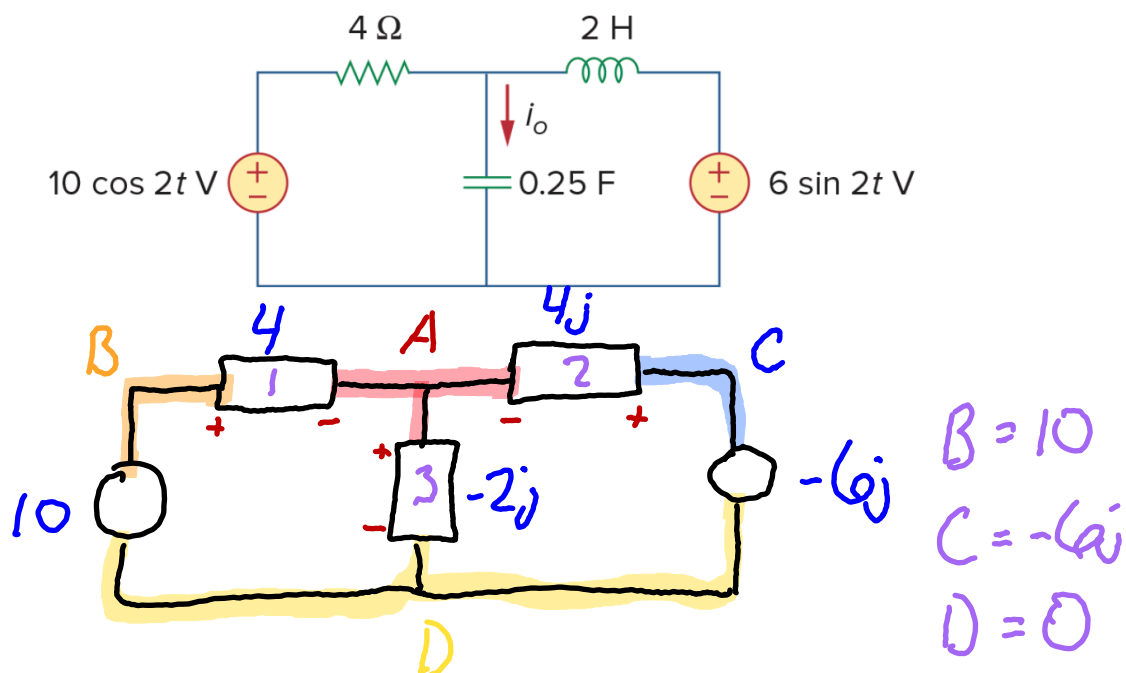
$$\frac{16e^{-90j}}{4-3j} + 2 = C + \frac{C}{6+8j} + \frac{C}{4-3j}$$

$$\frac{16e^{-90j}}{4-3j} + 2 = C \left( 1 + \frac{1}{6+8j} + \frac{1}{4-3j} \right)$$

$$C = \frac{\frac{16e^{-90j}}{4-3j} + 2}{\left( 1 + \frac{1}{6+8j} + \frac{1}{4-3j} \right)}$$

$$V_o = 3.14 - 2.2j \text{ V}$$

$$V_o = 3.83 \cos(4t - 35^\circ)$$

3. Find  $i_o(t)$ .

KCL @ A

$$I_1 + I_2 = I_3$$

$$V_1 = 10 - A$$

$$V_2 = -6j - A$$

$$V_3 = A$$

$$\frac{V_1}{4} + \frac{V_2}{4j} = -\frac{V_3}{2j}$$

$$\frac{10-A}{4} + \frac{-6j-A}{4j} = -\frac{A}{2j}$$

$$-\frac{A}{4} - \frac{A}{4j} + \frac{A}{2j} = -\frac{10}{4} + \frac{6j}{4j}$$

$$A\left(-\frac{1}{4} - \frac{1}{4j} + \frac{1}{2j}\right) = -\frac{10}{4} + \frac{6j}{4j}$$

$$A = \frac{-\frac{10}{4} + \frac{6j}{4j}}{-\frac{1}{4} - \frac{1}{4j} + \frac{1}{2j}} = 2 - 2j$$

$$i_o(t) = 1 + j$$

$$i_o(t) = 1.41 \cos(2t + 45^\circ)$$