Problem 1 (3 points)
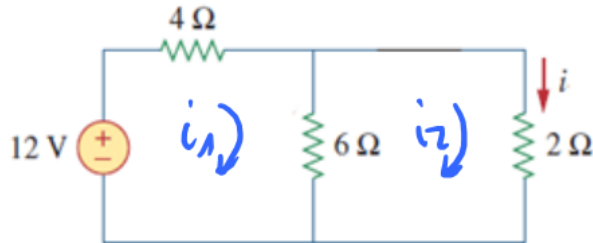
Given the DC circuit in next figure, use mesh analysis to find the current through the 2 ohm resistor.

$$10\,i_1 - 6\,i_2 = 12v$$
$$-6\,i_1 + 8\,i_2 = 0\,V$$

$$i = i_2 = \frac{\begin{vmatrix} 10 & 12 \\ -6 & 0 \end{vmatrix}}{\begin{vmatrix} 10 & -6 \\ -6 & 8 \end{vmatrix}} = \frac{6 \times 12}{44} = 1.64\ A$$

Problem 2 (4 points)

Given the AC circuit in next figure. (1) Use mesh analysis to find the current (Frequency/Complex and time domains) in the left mesh, (2) Use mesh analysis to find the current (Frequency/Complex and time domains) in the right mesh.
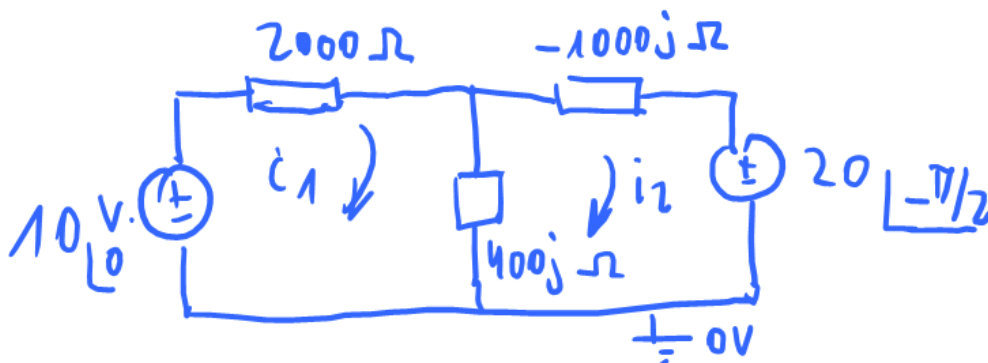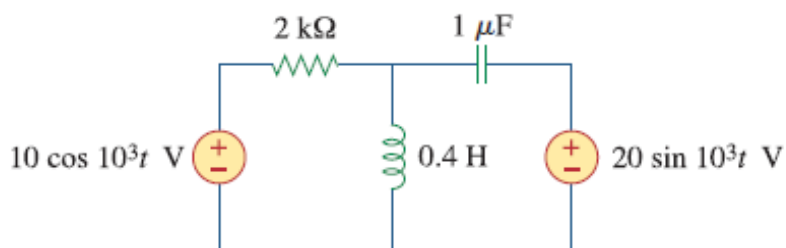
$$(2000 + 400j) i_1 - 400j \, i_2 = 10$$
$$- 400j \, i_1 \qquad - 600j \, i_2 = 20j$$

(1) $i_1 = 8 \underline{|-1.25 \, rad} \ mA$

$i_1(t) = 8 \cos(1000t - 1.25) \, mA$

(2) $i_2 = 21 \underline{|-0.14 \, rad} \ A$

$i_2(t) = 21 \cos(1000t - 0.14) \, A$

Problem 3 (3 points)

(1) Find the Thevenin equivalent across nodes a and b of the circuit in next figure, (2) Apply source transformation at the circuit found in (1) to find the Norton equivalent of the circuit in next figure.