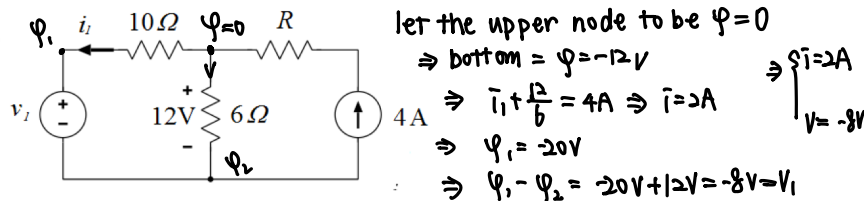


Homework Policy:

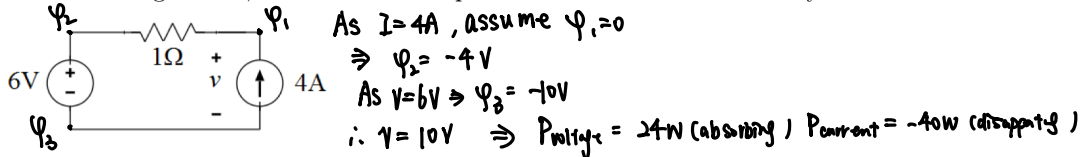
- Homework assignments in ECE 210 constitute an essential component of your learning experience in the course and prepare you for your mid-term 'hour exams' and the end-of-semester 'final exam' in most effective ways – investing time to do your homework with care will pay off when you are taking your exams. You will be expected to provide detailed explanations of your solutions in order to obtain full credit in your homework assignments. Conversely, solutions lacking full explanations will receive **zero credit** even when the answer provided may be correct and furthermore incorrect answers without any work shown may lead to 'academic integrity violation' cases being opened against you. Some of the homework problems you will be assigned will resemble problems from previous semesters but with modified parameters and/or inputs. Your comprehensive homework solutions will naturally be expected to match the versions of the problems assigned during the current semester, whereas solutions or answers matching the versions from previous semesters will once again lead to 'academic integrity violation' cases being brought against you. Please keep these cautionary remarks in mind as you are working out your homework assignments and avoid submitting unsubstantiated solutions to **avoid** any misinterpretations as explained above.

Problems:

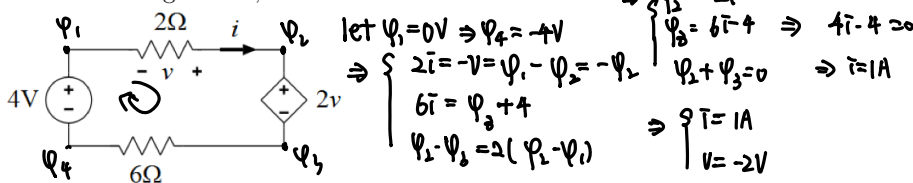
1. For the following circuit, obtain i_1 and v_1 .



2. In the following circuit, obtain v and the power absorbed and delivered by each source.

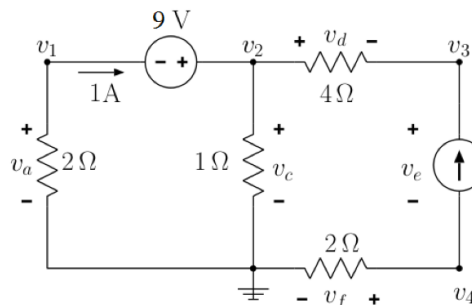


3. For the following circuit, obtain i and v .



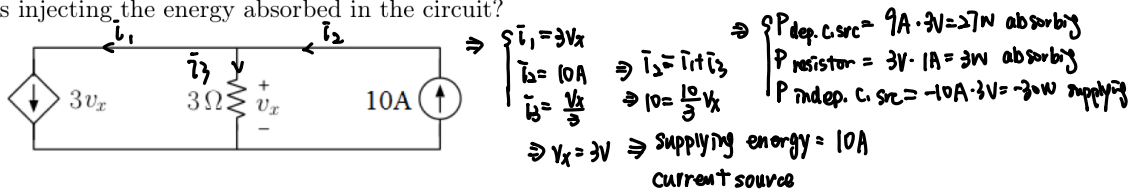
4. Consider the following circuit. (NOTE: the original pdf had 12V for the voltage source but it made the circuit inconsistent. Use the 9V source as pictured below.)

- (a) Determine all the unknown element and node voltages.
(b) What is the voltage drop in the circuit from the reference to node 4?
(c) What is the voltage rise from node 2 to node 3?
(d) What is the voltage drop from node 1 to the reference?

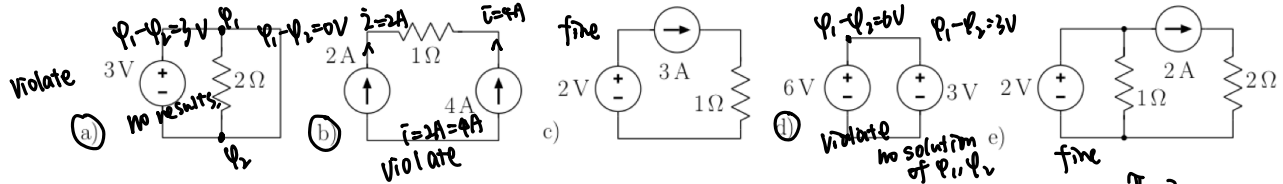


- (b) Voltage drop = $v_{ref} - v_{node 4}$
 $= 0 - (-12V) = 12V$
(c) Voltage rise = $v_3 - v_2 = 31V - 7V = 24V$
(d) Voltage drop = $v_1 - v_{ref} = -2V$

5. In the following circuit determine v_x and calculate the absorbed power of each circuit element. Which element is injecting the energy absorbed in the circuit?



6. Some of the following circuits violate KVL/KCL and/or basic definitions of two-terminal elements given in Section 1.3. Identify these ill-specified circuits and explain the problem in each case.



7. Let $A = \sqrt{3} + j\sqrt{3}$ and $B = -1 + j\sqrt{3}$.
- Express A in exponential form.
 - Express B in exponential form.
 - Determine the magnitudes of $A + B$ and of $A - B$.
 - Express AB and A/B in rectangular form.
- Handwritten calculations for problem 7:
- $$\begin{aligned} (a) A &= \sqrt{6} \left(\frac{1}{2} + \frac{j}{2} \right) = \sqrt{6} e^{j\frac{\pi}{4}} \\ (b) B &= 2 \left(-\frac{1}{2} + \frac{j}{2} \right) = 2 e^{j\frac{3\pi}{4}} \\ (c) A+B &= (\sqrt{3}-1, \sqrt{3}) \cdot (1, j) \Rightarrow \text{magnitude} = \sqrt{4+2\sqrt{3}+2} = \sqrt{6+2\sqrt{3}} \\ A-B &= (\sqrt{3}+1, 0) \cdot (1, j) \Rightarrow \text{magnitude} = \sqrt{4+2\sqrt{3}} \\ (d) AB &= 2\sqrt{6} e^{j\frac{7\pi}{4}} = (-2\sqrt{3}, 2\sqrt{3}) \\ A/B &= \frac{\sqrt{6}}{2} e^{j(\frac{\pi}{4}-\frac{3\pi}{4})} = \frac{\sqrt{6}}{2} e^{-j\frac{\pi}{2}} = \left(\frac{\sqrt{6}}{2} \cos \frac{\pi}{2}, \frac{\sqrt{6}}{2} \sin \frac{\pi}{2} \right) = (0, \sqrt{3}) \end{aligned}$$
8. The two parts of this problem are unrelated.
- Determine the rectangular forms of $\sqrt{2}e^{j\frac{\pi}{4}}$, $\sqrt{2}e^{-j\frac{\pi}{4}}$, $\sqrt{2}e^{j\frac{3\pi}{4}}$, $\sqrt{2}e^{-j\frac{3\pi}{4}}$, $2e^{j\frac{\pi}{2}}$, and $2e^{-j\frac{\pi}{2}}$.
 - Simplify $P = 2e^{j\frac{5\pi}{4}} - 2e^{-j\frac{5\pi}{4}}$, $Q = 8e^{-j\frac{\pi}{4}} + 8\sqrt{2}e^{-j\pi}$, and $R = \frac{e^{j\frac{3\pi}{4}}}{e^{-j\frac{\pi}{4}}}$.

9. Repeat problem 2 using source transformations to obtain the voltage (not the power).

8. a) $\sqrt{2}e^{j\frac{\pi}{4}} = (1, 1)$, $\sqrt{2}e^{-j\frac{\pi}{4}} = (1, -1)$, $\sqrt{2}e^{j\frac{3\pi}{4}} = (-1, 1)$, $\sqrt{2}e^{-j\frac{3\pi}{4}} = (-1, -1)$, $2e^{j\frac{\pi}{2}} = (0, 2)$

b) $P = 2\left(\frac{1}{2}, \frac{1}{2}\right) - 2\left(\frac{1}{2}, -\frac{1}{2}\right) = 2(0, 1) = (0, 2)$

$Q = 8\left(\frac{1}{2}, -\frac{1}{2}\right) + 8\sqrt{2}(-1, 0) = (4\sqrt{2} - 8\sqrt{2}, -4\sqrt{2}) = (-4\sqrt{2}, -4\sqrt{2})$

