Homework 2

Due date: 11th Oct, 2022

Turn in your homework in class

Rules:

- Work on your own. Discussion is permissible, but extremely similar submissions will be judged as plagiarism.

- Please show all intermediate steps: a correct solution without an explanation will get zero credit.

- Please submit on time. No late submission will be accepted.

- Please prepare your submission in English only. No Chinese submission will be accepted.

1. For the circuit below,

(a) Use superposition theorem to find the voltage drop between *a* and *b*, namely V_{ab}

(b) Use source transformation (at least twice) to find V_{ab}

(c) Find the Norton equivalent circuit at terminals *a* and *b*
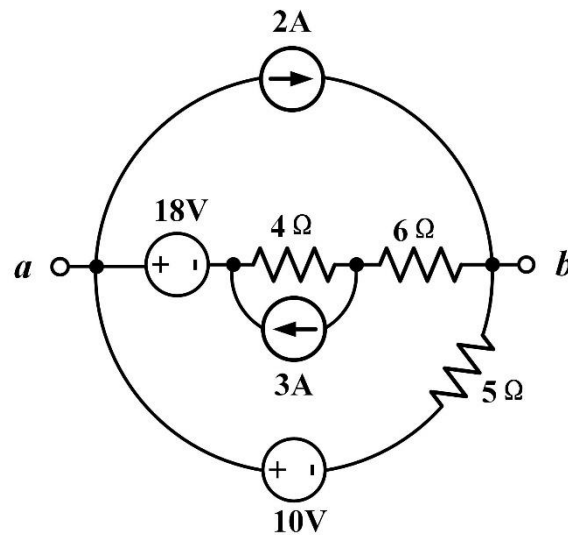
2. (a) Apply superposition to find V_0 in the circuit below when R_L=250Ω.

(b) Find the Thevenin equivalent circuit for the left hand side circuit of node **a** and node **b**.

(c) Determine the value of R_L when maximum power could be transferred to it.

(d) for the situation in (c), find the power absorbed by the 520V voltage source and the 1A current source, **respectively**.
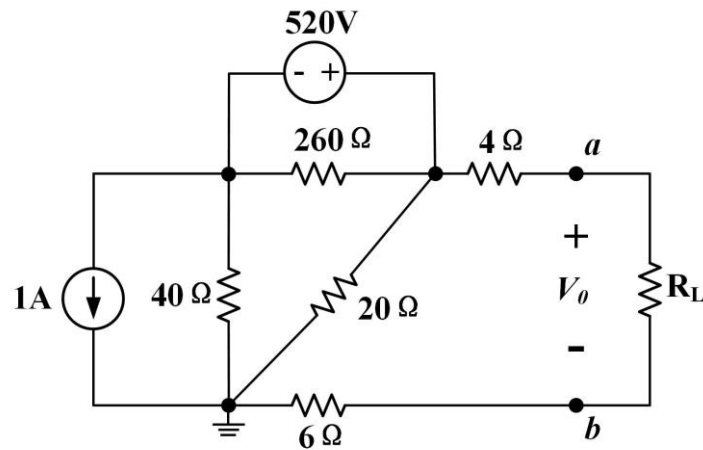
3. (a) Find the Thevenin equivalent circuit at the terminals **a** and **b**.

(b) If a load resistor R_L is connected at terminals **a** and **b**, what is the maximum power that could be transferred to it by this circuit, and what is the value of R_L in this situation? Also, find the power absorbed by the three sources, **respectively**.
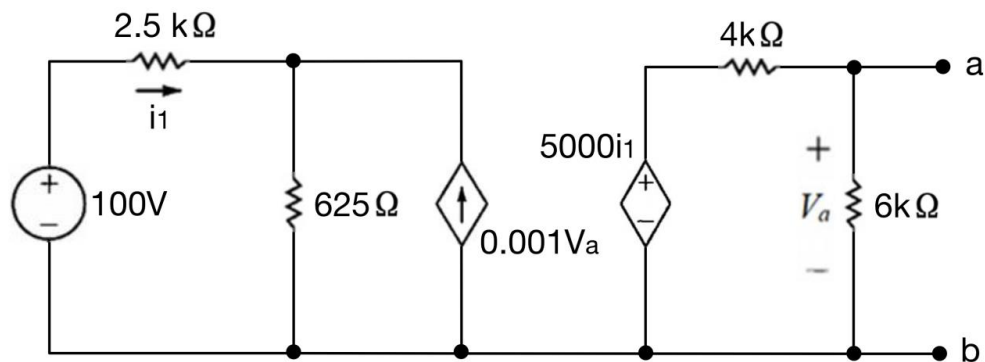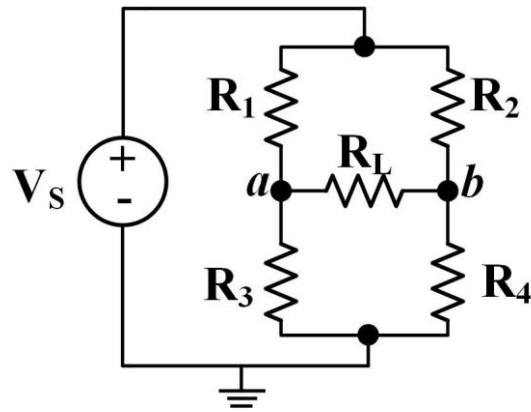
4. For the circuit below, find the Norton equivalent with respect to the terminals **a, b**.
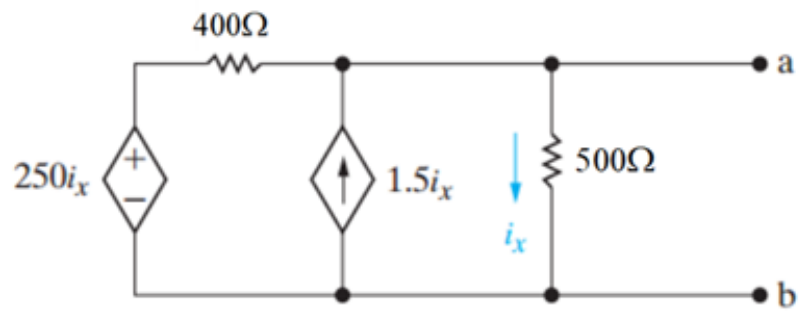
5. The values of V_S, R_1, R_2, R_3, R_4 are known positive constants.

Use them to find:

(a) The Thevenin equivalent circuit between node *a* and *b*.

(b) The resistance of R_L that absorbs the maximum power, and the maximum power P_{max} absorbed by the load R_L

6. Find the voltage gain V_{out}/V_{in} of the following circuit, if $R_1=1k\Omega$, $R_2=R_3=2k\Omega$, $R_4=R_5=4k\Omega$.

R_3

R_2

V_{in} R_1

V_{out}

R_5

R_4
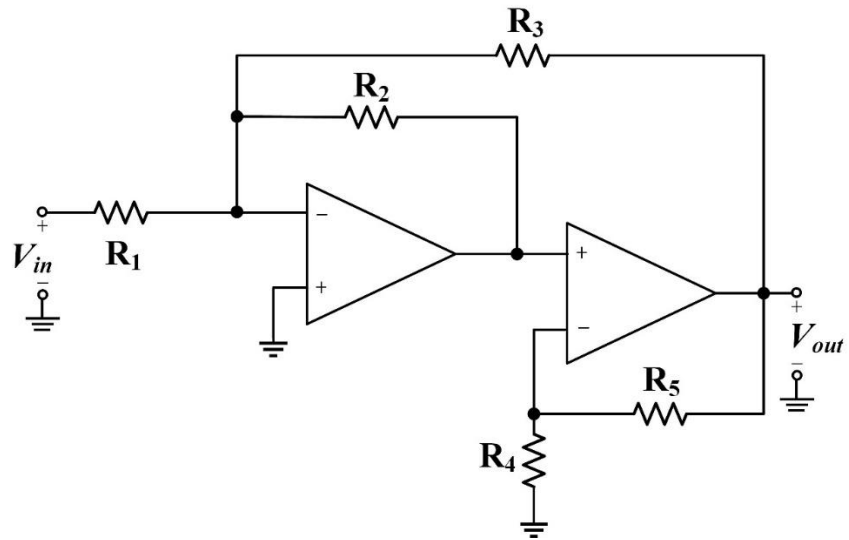
7. For the following circuit, find the output voltage V_{out} in terms of V_1 to V_4. Note that all the resistors in the circuit have the same resistance of $1k\Omega$. (Also, please pay attention to the given reference direction of the independent voltage sources)