Catch up on the reading on the course website.

1. Redo Example 2.2 in Alexander and Sadiku, 5h Edition for the following element values: source $V = 6.9\,\text{V}$, resistance $R = 2.7\,\Omega$.

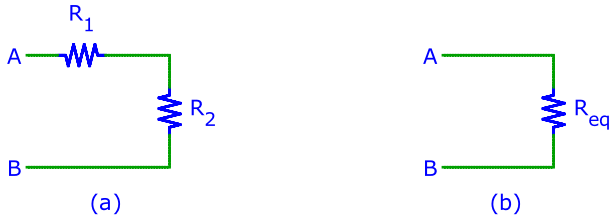
   $i =$ ☐

   $G =$ ☐

2. (D-3) Diagrams of actual circuits are frequently complicated but can be simplified by representing one or more components with a single one without changing overall circuit behavior.

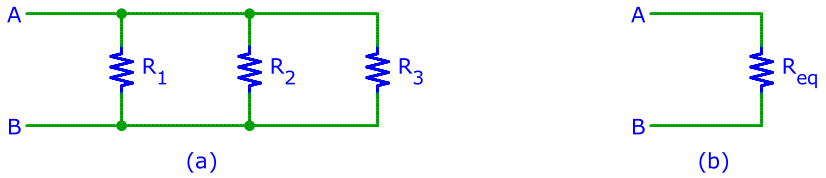
   Find the value of R_{eq} such that circuits (a) and (b) have the same I/V characteristic. Use $R_1 = 6.3\,\text{k}\Omega$ and $R_2 = 4.9\,\text{k}\Omega$.

   $R_{\text{eq}} =$ ☐



3. (D-4) Find the value of R_{eq} such that circuits (a) and (b) have the same I/V characteristic. Use $R_1 = 9.8\,\text{k}\Omega$, $R_2 = 4.9\,\text{k}\Omega$ and $R_3 = 8.4\,\text{k}\Omega$.

   $R_{\text{eq}} =$ ☐



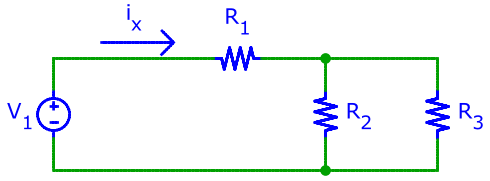
4. Redo practice problem 2.5 in Alexander and Sadiku, 5h Edition with the 10 V source replaced by a -10 V source.

   $v_1 =$ ☐

   $v_2 =$ ☐

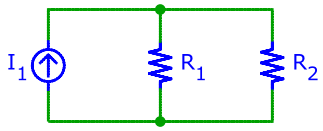
5. (F-1) Calculate the value of current i_x. Parameter: $V_1 = 98\,\text{V}$, $R_1 = 82\,\text{k}\Omega$, $R_2 = R_3 = 93\,\text{k}\Omega$.

   $i_x =$ ☐



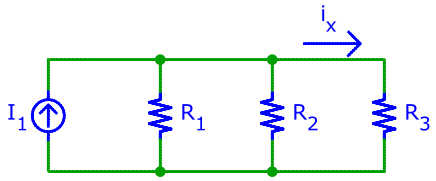
6. (F-2) Calculate the power P_{R_1} dissipated in resistor R_1. Parameter: $I_1 = 78\,\text{mA}$, $R_1 = 17\,\text{k}\Omega$, $R_2 = 42\,\text{k}\Omega$.

$P_{R_1} =$ ☐



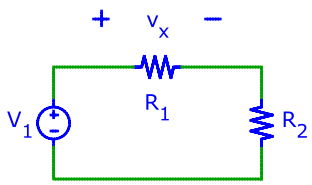
7. (F-3) Find the value of current i_x. Parameter: $I_1 = 16\,\text{mA}$, $R_1 = 63\,\text{k}\Omega$, $R_2 = 74\,\text{k}\Omega$, $R_3 = 82\,\text{k}\Omega$.

$i_x =$ ☐



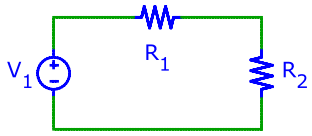
8. (F-5) Calculate the value of voltage v_x. Parameter: $V_1 = 95\,\text{V}$, $R_1 = 66\,\text{k}\Omega$, $R_2 = 89\,\text{k}\Omega$.

$v_x =$ ☐



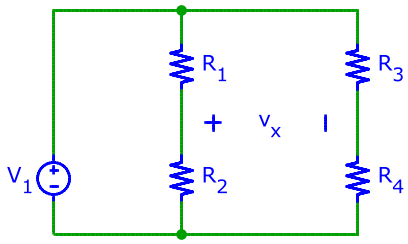
9. (F-7) Calculate the power P_{R_2} dissipated in resistor R_2. Parameter: $V_1 = 13\,\text{V}$, $R_1 = 28\,\text{k}\Omega$, $R_2 = 24\,\text{k}\Omega$.

$P_{R_2} =$ ☐



10. (F-8) Calculate the value of voltage v_x. Parameter: $V_1 = 68\,\text{V}$, $R_1 = 46\,\text{k}\Omega$, $R_2 = 99\,\text{k}\Omega$, $R_3 = 26\,\text{k}\Omega$, $R_4 = 86\,\text{k}\Omega$.

$v_x =$ ☐



11. (2-13) For how many seconds will a 8.9 V battery with 3.5 kJ capacity power a flash light consuming 5.2 mW?

    [ ]

12. (2-6)

    The number of free electrons (i.e. available to conduct current) in copper is about $3 \times 10^{24}\text{cm}^{-3}$. Calculate the carrier velocity in a copper wire with radius 6.8 mm that conducts 6.8 A. The SI unit for velocity is `m/s`. E.g. `1.4nm/s`.

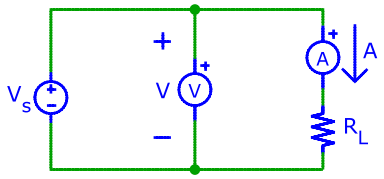
    [ ]

    The information is carried by the electric field which propagates at or near the speed of light, not by the electrons which travel much more slowly.

13. (D-2) In the circuit below, a volt- and an ampere-meter are used to measure the voltage across and current through resistor R_L. P_{R_L} and P_{V_s} denote the power *dissipated* in R_L and V_s, respectively. Fill in the table below:

$V = 7.2\,\text{V}$	$A = 9.0\,\text{mA}$	$R_L =$	
		$P_{R_L} =$	
		$P_{V_s} =$	
$V = -3.5\,\text{V}$	$A = 8.0\,\text{mA}$	$R_L =$	
		$P_{R_L} =$	
		$P_{V_s} =$	

    If you apply sign conventions correctly, some of your answers will seem impossible. The objective of this problem is for you to become sufficiently confident with sign conventions to apply them correctly in any situation you may encounter. Besides, it is possible to build circuits that behave this way (and they have important applications).

14. Redo practice problem 2.10 in Alexander and Sadiku, 5h Edition with the values of all resistors doubled.

    $R_{AB} =$ [ ]

15. (J-15) Use the Python matplotlib (install if not already on your system) to plot $\sin(t)$ and $\cos(t)$ for $t = 0 \ldots 2\pi$. Put your code into the box below.

16. (J-16) Write a gradebook in Python with functions to record scores and compute GPAs use the skeleton provided below. Suggestion: use a dictionary data structure for storing scores.

```
class GradeBook:

    def __init__(self):
        '''Initializer.'''
        pass



    def add_score(self, student_name, score):
        '''Add new score for student with specified name
        to gradebook. Automatically create an entry if no
        student with this name exists in the gradebook.'''
        pass
        # add your code here ...




    def print_gradebook(self):
        '''Print as comma-separated table.'''
        pass
        # add your code here ...









    def compute_gpa(self, student_name=None):
        '''Compute GPA (average of all scores) of student
        with given name, or a table with one row for each
        student with name and GPA if called without argument.'''
        pass
        # add your code here ...
```

Sample output:

```
>>> from gradebook import GradeBook
>>> g = GradeBook()
>>> g.add_score('Ann', 4)
>>> g.add_score('Peter', 2)
>>> g.add_score('Ann', 2)
>>> g.add_score('Ann', 3)
>>> g.add_score('Isabelle', 5)
>>> g.print_gradebook()
Ann, 4, 2, 3
Peter, 2
Isabelle, 5
>>> g.compute_gpa()
GPA for Ann is 3.0
GPA for Peter is 2.0
GPA for Isabelle is 5.0
>>> g.compute_gpa('Bill')
No student with name Bill
>>> g.compute_gpa('Ann')
GPA for Ann is 3.0
```