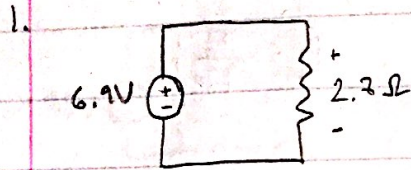


EE49 HW02

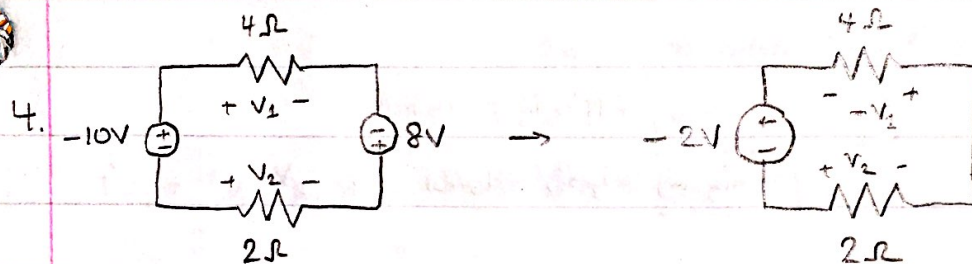
$$i = V/R = 6.9V / 2.7\Omega = \boxed{2.56 A} = i$$



$$G = \frac{1}{R} = \frac{1}{2.7\Omega} = \boxed{0.37 S} = G$$

2. $R_{eq} = R_1 + R_2 = 6.3 k\Omega + 4.9 k\Omega = \boxed{11.2 k\Omega}$

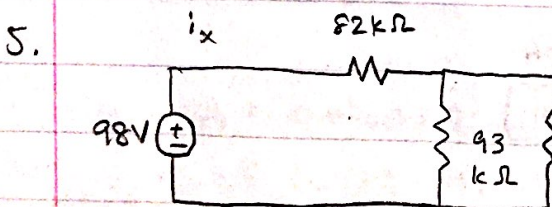
3. $R_{eq} = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}} = \frac{1}{\frac{1}{4.8 k\Omega} + \frac{1}{4.9 k\Omega} + \frac{1}{8.4 k\Omega}} = \boxed{2.352 k\Omega}$



$$\begin{aligned} V_1 &= -\frac{4}{3} V \\ V_2 &= \frac{2}{3} V \end{aligned}$$

$$I = -\frac{2V}{6\Omega} = -\frac{1}{3} A$$

$$-2V = 4\Omega \left(-\frac{1}{3} A\right) + 2\Omega \left(-\frac{1}{3} A\right)$$



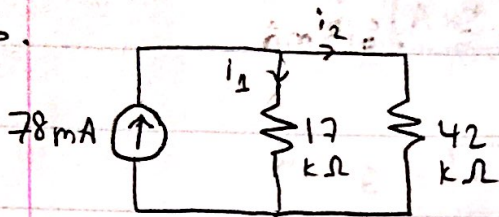
$$i_x = \frac{98V}{128.5 k\Omega} = \boxed{0.763 mA}$$

$$i_x = \frac{98V}{R_{eq}} \quad \left| \quad R_{eq} = 82 k\Omega + \frac{1}{\frac{1}{93} + \frac{1}{93}} k\Omega \right.$$

$$= 82 k\Omega + 46.5 k\Omega = 128.5 k\Omega$$

HW02

6.



$$17k\Omega \cdot i_1 = 42k\Omega \cdot i_2$$

$$i_1 = \frac{42}{17} i_2$$

$$i_1 + i_2 = 78\text{mA}$$

$$\frac{42}{17} i_2 + i_2 = 78\text{mA}$$

$$\frac{59}{17} i_2 = 78\text{mA} \rightarrow i_2 = 22.47\text{mA}$$

$$i_1 = 55.53\text{mA}$$

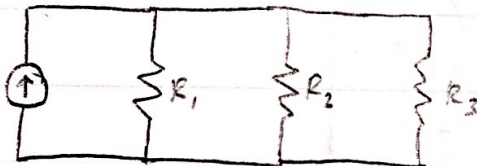
$$P_{R_1} = I_{R_1} \cdot V_{R_1}$$

$$= I_{R_1}^2 \cdot R_1$$

$$= 55.53\text{mA}^2 \cdot 17k\Omega$$

$$= \boxed{52.42\text{W}}$$

7.



$$i_1 + i_2 + i_3 = 16\text{mA}$$

$$i_1 R_1 = i_2 R_2 = i_3 R_3$$

$$63k\Omega \cdot i_1 = 74k\Omega \cdot i_2 = 82k\Omega \cdot i_3$$

$$i_1 = \frac{74}{63} \cdot i_2$$

$$\left(\frac{74}{63} + 1 + \frac{74}{82} \right) i_2 = 16\text{mA}$$

$$i_3 = \frac{74}{82} \cdot i_2$$

$$i_2 = 5.2\text{mA}$$

$$i_1 = 6.1\text{mA}$$

$$\boxed{i_3 = 4.7\text{mA}}$$

HW02

8.



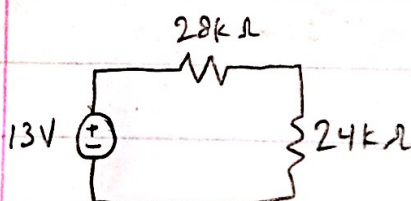
$$i = V/R_{eq} = 95V / 155k\Omega = .613mA$$

$$R_{eq} = 66 + 89k\Omega = 155k\Omega$$

$$-V_x = .613mA \cdot 66k\Omega$$

$$V_x = \boxed{-40.45V}$$

9.



$$i = V/R_{eq} = 13V / 52k\Omega = 0.25mA$$

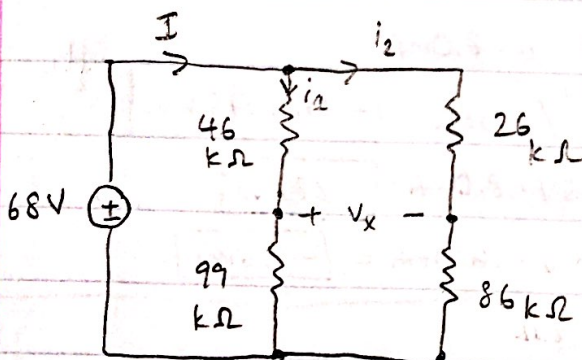
$$R_{eq} = (28 + 24)k\Omega = 52k\Omega$$

$$V_{R_2} = 0.25mA \cdot 24k\Omega$$

$$= 6V$$

$$P_{R_2} = I_{R_2} V_{R_2} = 0.25mA \cdot 6V = \boxed{1.5mW}$$

10.



$$I = V/R_{eq} = 68V / 63.19k\Omega = 1.08mA$$

$$R_{eq} = \frac{1}{\frac{1}{(46+99)} + \frac{1}{(26+86)}}k\Omega = 63.19k\Omega$$

$$V_{R_1} = 46k\Omega \cdot 0.47mA = 21.62V$$

$$V_{R_3} = 26k\Omega \cdot 0.61mA = 15.86V$$

$$V_x = V_{R_3} - V_{R_1} = -5.76V$$

$$\boxed{V_x = -5.76V}$$

$$i_1 + i_2 = 1.08mA$$

$$145k\Omega \cdot i_1 = 112k\Omega \cdot i_2$$

$$i_1 = \frac{112}{145} i_2 \rightarrow \frac{257}{145} i_2 = 1.08mA$$

$$i_2 = 0.61mA$$

$$i_1 = 0.47mA$$

Hw02

11. $T = 3.5 \text{ kJ} / 5.2 \text{ mW}$

$= 0.67 \cdot 10^6 \text{ s} = \boxed{6.7 \cdot 10^5 \text{ s}}$

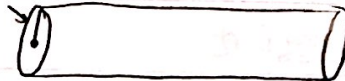
copper = $3 \cdot 10^{24} \text{ electrons/cm}^3$

$= 3 \cdot 10^{21} \text{ electrons/mm}^3$

$6.8 \text{ A} = 6.8 \text{ C/s}$

$= 6.8 \cdot 6.242 \cdot 10^{18} \frac{\text{electrons}}{\text{s}}$

rs 6.8mm



x mm

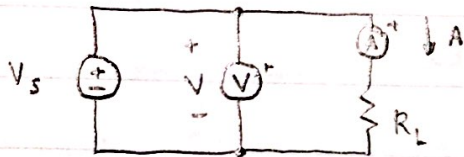
12.

velocity = $6.8 \cdot 6.242 \cdot 10^{18} \frac{\text{elec}}{\text{s}} \div 3 \cdot 10^{21} \frac{\text{elec}}{\text{mm}^3} \div (6.8 \text{ mm})^2 \cdot \pi$

$= .09745 \cdot 10^{-3} \text{ mm/s}$

$= \boxed{9.745 \cdot 10^{-8} \text{ m/s}}$

13.



$V = 7.2 \text{ V} \quad A = 9.0 \text{ mA}$

$R_L = 7.2 \text{ V} / 9.0 \text{ mA} = \boxed{0.8 \text{ k}\Omega}$

$P_{R_L} = 7.2 \text{ V} \cdot 9.0 \text{ mA} = \boxed{64.8 \text{ mW}}$

$P_{V_S} = 7.2 \text{ V} \cdot 9.0 \text{ mA} = \boxed{129.6 \text{ mW}}$

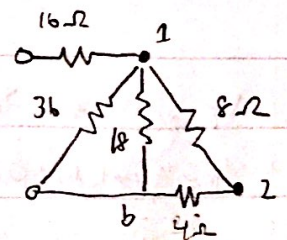
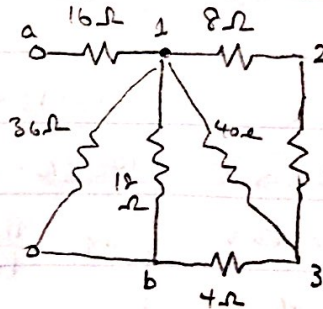
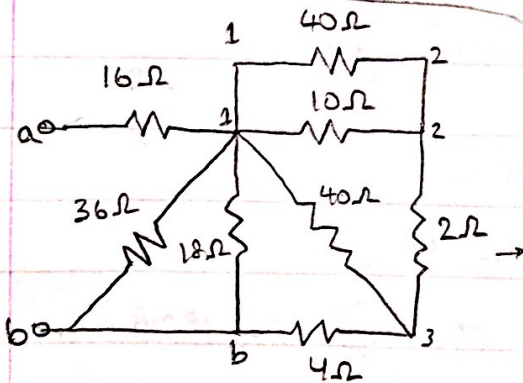
$V = -3.5 \text{ V} \quad A = 8.0 \text{ mA}$

$R_L = -3.5 \text{ V} / 8.0 \text{ mA} = \boxed{-0.4375 \text{ k}\Omega}$

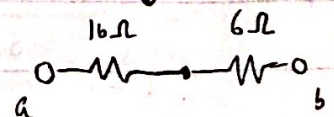
$P_{R_L} = -3.5 \text{ V} \cdot 8.0 \text{ mA} = \boxed{-28 \text{ mW}}$

$P_{V_S} = -3.5 \text{ V} \cdot 16.0 \text{ mA} = \boxed{-56 \text{ mW}}$

14.



$R_{AB} = 22 \Omega$

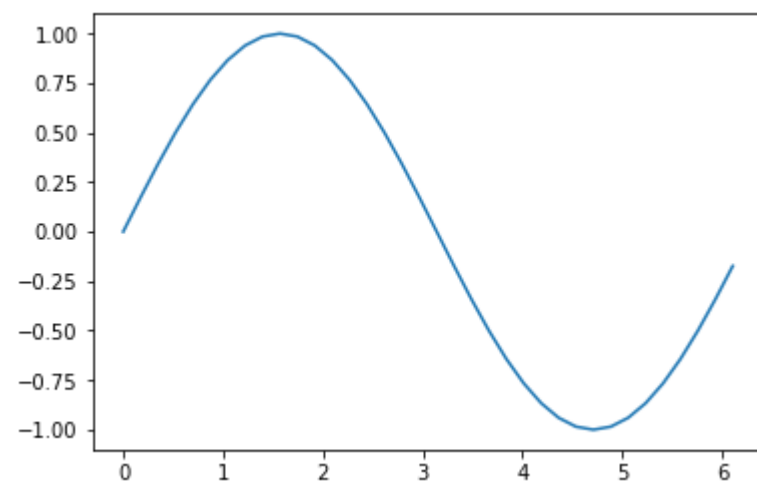


15

```
In [6]: import matplotlib.pyplot as plt
import numpy as np

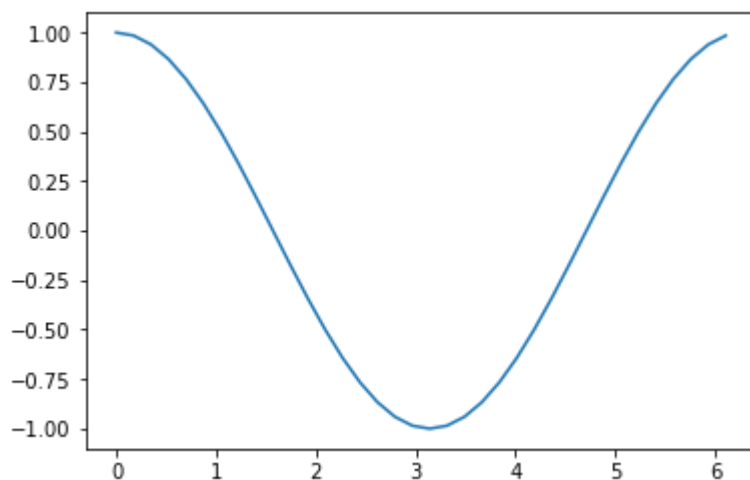
time = np.arange(0, 2 * np.pi, (2 * np.pi)/36)
amplitude = np.sin(radians)
plt.plot(time, amplitude)
plt.show
```

Out[6]: <function matplotlib.pyplot.show(*args, **kw)>



```
In [7]: time2 = np.arange(0, 2 * np.pi, (2 * np.pi)/36)
amplitude2 = np.cos(radians)
plt.plot(time2, amplitude2)
plt.show
```

Out[7]: <function matplotlib.pyplot.show(*args, **kw)>



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```
In [22]: class Gradebook:
    def __init__(self):
        self.gradebook = {}
        self.up_to_date = False
        self.gpa = {}

    def add_score(self, student_name, score):
        self.up_to_date = False
        if student_name not in self.gradebook.keys():
            self.gradebook[student_name] = [score]
        else:
            self.gradebook[student_name] += [score]

    def print_gradebook(self):
        for student, grades in self.gradebook.items():
            line = student + ', ' + ', '.join(str(grade) for grade in grades)
            print(line)

    def compute_gpa(self, student_name=None):
        if not self.up_to_date:
            for student, grades in self.gradebook.items():
                self.gpa[student] = np.mean(grades)
            self.up_to_date = True
        if not student_name:
            for student, gpa in self.gpa.items():
                line = "GPA for " + student + " is " + str(gpa)
                print(line)
        else:
            if student_name not in self.gpa.keys():
                line = "No student with name " + student_name
            else:
                line = "GPA for " + student_name + " is " + str(self.gpa[student_name])
            print(line)
```

```
In [23]: 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()
g.compute_gpa()
g.compute_gpa('Bill')
g.compute_gpa('Ann')
```

```
Ann, 4, 2, 3
Peter, 2
Isabelle, 5
GPA for Ann is 3.0
GPA for Peter is 2.0
GPA for Isabelle is 5.0
No student with name Bill
GPA for Ann is 3.0
```

In []:

