# Assignment 5

March 4, 2018

In [8]:
```
import numpy as np

'''
        Unless your instructor provides you with other values, assume
    each voltage source and each resistor has a value 10Œ its
    identifying number. (i.e. V2=20 V, R3=30.)
'''

'''
EXERCISE 1

1. On paper
2.

'''

R1, R2, R3 = 10, 20, 30
V1, V2 = 10, 20

M = np.array([[R1, 0, R3], [0, -R2, R3], [1, -1, -1]])
b = np.array([V1, V2, 0])

x = np.linalg.solve(M, b)

print x
```

```
[-0.09090909 -0.45454545  0.36363636]
```

In [ ]:
```
'''
3. Substituting currents back into the system of equations in 1, we can
   verify that they are the solutions

'''
```

In [9]:
```
'''

EXERCISE 2
```

```
        1. On paper
        2. On paper
        3.

        '''

        R1, R2, R3, R4, R5, R6 = 10, 20, 30, 40, 50, 60
        V1, V2, V3, V4 = 10, 20, 30, 40

        M = np.array([
                                        [R1, 0, R3, 0, 0, 0],
                                        [0, 0, 0, -R4, 0, 0],
                                        [0, -R2, R3, R4, 0, -R6],
                                        [0, -R2, R3, 0, 0, 0],
                                        [1, -1, -1, 0, 0, 0],
                                        [0, 0, 0, 0, -R5, 0]
                                ])

        b = np.array([
                                        V1,
                                        V4,
                                        V3,
                                        V2,
                                        0,
                                        V4
                                ])

        I = np.linalg.solve(M, b)
        print I
```

```
[-0.09090909 -0.45454545  0.36363636 -1.         -0.8        -0.83333333]
```

In [ ]:
```
        '''
        4. Yes, the values of currents found solve the system of equations with
           which we started (2)
        5. Both solutions for the exercises have the same values for I1, I2, I3.
           This is because the circuit shown in Exercise 2 actually contains the
           sub-loop of the same circuit for Exercise 1 from the upper left. As per
           the assumption stated, the same values of R and V were also used in both exercises.

        '''
```