Green University of Bangladesh
Department of Computer Science and Engineering (CSE)
Faculty of Sciences and Engineering
Semester: Fall, Year: 2022, B.Sc. in CSE

MAT Assignment(Group-3)

Course Title: Linear Algebra & Vector Analysis
Course Code: MAT 105   Section: D11

Student Details

Name	ID
Md. Maruf Sarker	221002591

Submission Date   : 22 December 2022
Course Teacher's Name   : Mr. Md. Humayun Kabir

[For Teachers use only: Don't Write Anything inside this box]

Lab Report Status
Marks: ....
Signature: ....
Comments: ....
Date: ....

1. Determine the coefficients of the given polynomial
$$p(x) = a_0 + a_1x + a_2x^2$$

Whose graph passes through the points (1, 3), (2, Last digit of your ID), and (3,8). Also plot the function using MATLAB command (having a proper title, x and y axis notation).

```cpp
// 1. Determine the coefficients of the given polynomial
p(x) = a0 + a1x + a2x2

// Whose graph passes through the points (1, 3), (2, Last
digit of your ID), and (3,8). Also plot the function
using MATLAB command (having a proper title, x and y axis
notation).

#include <bits/stdc++.h>
using namespace std;

int main(){
    int i, j, k, order;
    float M[20][20], r, p[100000], sum = 0.0;

    cout << "Enter the order of matrix: ";
    cin >> order;
    cout << "Enter the augmented matrix: " << endl;
    for(i = 1; i <= order; i++)
        for(j = 1; j <= (order + 1); j++)
            cin >> M[i][j];
    cout << endl;
```

```cpp
    cout << "Augmented Matrix: " << endl;
    for(i = 1; i <= order; i++){
        for(j = 1; j <= order + 1; j++)
            cout << M[i][j] << "\t";
        cout << endl;
    }


    for(j = 1; j <= order; j++)
        for(i = 1; i <= order; i++)
            if(i > j){
                r = M[i][j] / M[j][j];
                for(k = 1; k <= order + 1; k++)
                    M[i][k] = M[i][k] - r * M[j][k];
            }

    p[order] = M[order][order + 1] / M[order][order];
    for(i = order - 1; i >= 1; i--){
        sum=0.0;
        for(j = i + 1; j <= order; j++)
            sum = sum + M[i][j] * p[j];

        p[i] = (M[i][order + 1] - sum) / M[i][i];
    }

    cout << "\nSolution: " << endl;
    cout << "p = " << p[1] << endl;
    cout << "q = " << p[2] << endl;
    cout << "r = " << p[3] << endl;
}
```

Output:

```
● maruf@mms:~/Documents/GUB/green-cse-221/MAT/105/Assignment$ run
  Enter the order of matrix: 3
  Enter the augmented matrix:
  1 1 1 3
  1 2 4 3
  1 3 9 8

  Augmented Matrix:
  1       1       1       3
  1       2       4       3
  1       3       9       8

  Solution:
  p = 8
  q = -7.5
  r = 2.5
○ maruf@mms:~/Documents/GUB/green-cse-221/MAT/105/Assignment$ █
```

2. Using suitable command encode the message "ABBREVIATIONS" by using matrix A given below:

```cpp
// Using suitable command encode the message "ABBREVIATIONS" by
using matrix A given below:
#include <bits/stdc++.h>
using namespace std;
int main(){
    // taking the key from the user assuming that the matrix is a
2 x 2 square matrix
    int key[2][2];
    cout << "Enter the key matrix: " << endl;
    for(int i = 0; i < 2; i++){
        for(int j = 0; j < 2; j++){
            cin >> key[i][j];
        }
    }
```

```cpp
    // taking the message from the user
    string message;
    cout << "Enter the message: ";
    cin >> message;
    int encrypt_message[7][2] = {
        {1, 2},
        {2, 18},
        {5, 22},
        {9, 1},
        {20, 9},
        {15, 14},
        {19, 0}
    };
    int result[7][2];
    for(int i = 0; i < 7; i++){
        for(int j = 0; j < 2; j++){
            result[i][j] = 0;
            for(int k = 0; k < 2; k++){
                        result[i][j] += encrypt_message[i][k] *
key[k][j];
            }
            cout << result[i][j] << " ";
        }
    }cout << endl;
}
```
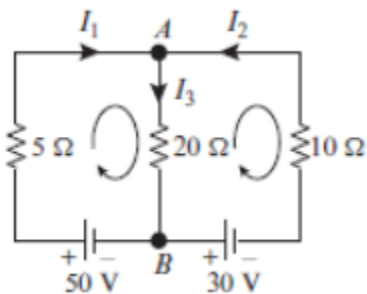
Output:

3. Determine the currents for the electrical network shown in the following figure:

Also solve the system by using MATLAB or any other programming language.

```cpp
// 3. Determine the currents for the electrical network
shown in the following figure:

#include <bits/stdc++.h>
using namespace std;

int main(){
    // we have to find the value of I1, I2, I3
    int I1, I2, I3;

    int R1, R2, R3;
    cout << "Enter the value of R1: ";
    cin >> R1;
```

```cpp
    cout << "Enter the value of R2: ";
    cin >> R2;
    cout << "Enter the value of R3: ";
    cin >> R3;



    int V1, V2;
    cout << "Enter the value of V1: ";
    cin >> V1;
    cout << "Enter the value of V2: ";
    cin >> V2;

    int i1, i2, i3;
    cout << "1) Type 1 if it is in" << endl;
    cout << "2) Type 0 if it is out" << endl;
    cout << "Enter three directions for A" << endl;
    cin >> i1 >> i2 >> i3;

    // i1 + i2 - i3 = 0;
    // => i3 = i1 + i2;
    if(i1 == 1 && i2 == 1 && i3 == 0) i3 = i1 + i2;
    else cout << "Wrong Input :(\n";
    // left loop
    // R1 * I1 + R2I3 = V1
    // R1 * I1 + R2 * (I1 + I2) = V1
    // R1 * I1 + R2 * I1 + R2 * I2 = V1
    // (R1 + R2) * I1 + R2 * I2 = V1;    ---------(1)

    // right loop
    // R3 * I2 + R2 * I3 = -V2;
    // R3 * I2 + R2 * (I1 + I2) = -V2;
```

```
    // R3 * I2 + R2 * I1 + R2 * I2 = -V2;
    // (R3 + R2) * I2 + R2 * I1 = -V2;   ---------(2)

    // multiplying (1) by 3 and (2) by 2
    // (R1 + R2) * 3 * I1 + R2 * 3 * I2 = 3 * V1;
    // (R3 + R2) * 2 * I2 + R2 * 2 * I1 = -2 * V2;

    // subtracting (2) from (1)
    int V = (V1 * 3) - (V2 * 2);
    int I = (R1 + R2) * 3 - (R3 + R2) * 2;

    I1 = V / I;
    I2 = (V1 - (R1 + R2) * I1) / R2;
    I3 = I1 + I2;
    cout << "I1 = " << I1 << endl;
    cout << "I2 = " << I2 << endl;
    cout << "I3 = " << I3 << endl;
}
```

Output:

```
maruf@mms:~/Documents/GUB/green-cse-221/MAT/105/Assignment$ run
Enter the value of R1: 5
Enter the value of R2: 20
Enter the value of R3: 10
Enter the value of V1: 50
Enter the value of V2: 30
1) Type 1 if it is in
2) Type 0 if it is out
Enter three directions for A
1 1 0
I1 = 6
I2 = -5
I3 = 1
maruf@mms:~/Documents/GUB/green-cse-221/MAT/105/Assignment$
```