LYCEUM OF THE PHILIPPINES UNIVESITY – CAVITE
GOVERNOR'S DRIVE, BRGY. MANGGAHAN, GENERAL TRIAS CITY, CAVITE
COLLEGE OF ENGINEERING, COMPUTER STUDIES AND ARCHITECTURE
DEPARTMENT OF ENGINEERING

NUMERICAL METHODS

FINAL PROJECT

GROUP PROJECT SUBMITTED BY:

Chavez, Charles Joseph B.

Tugano, John Benedict Z.

Ukpaka, Abraham Peter

CPE 401

NMTL01E

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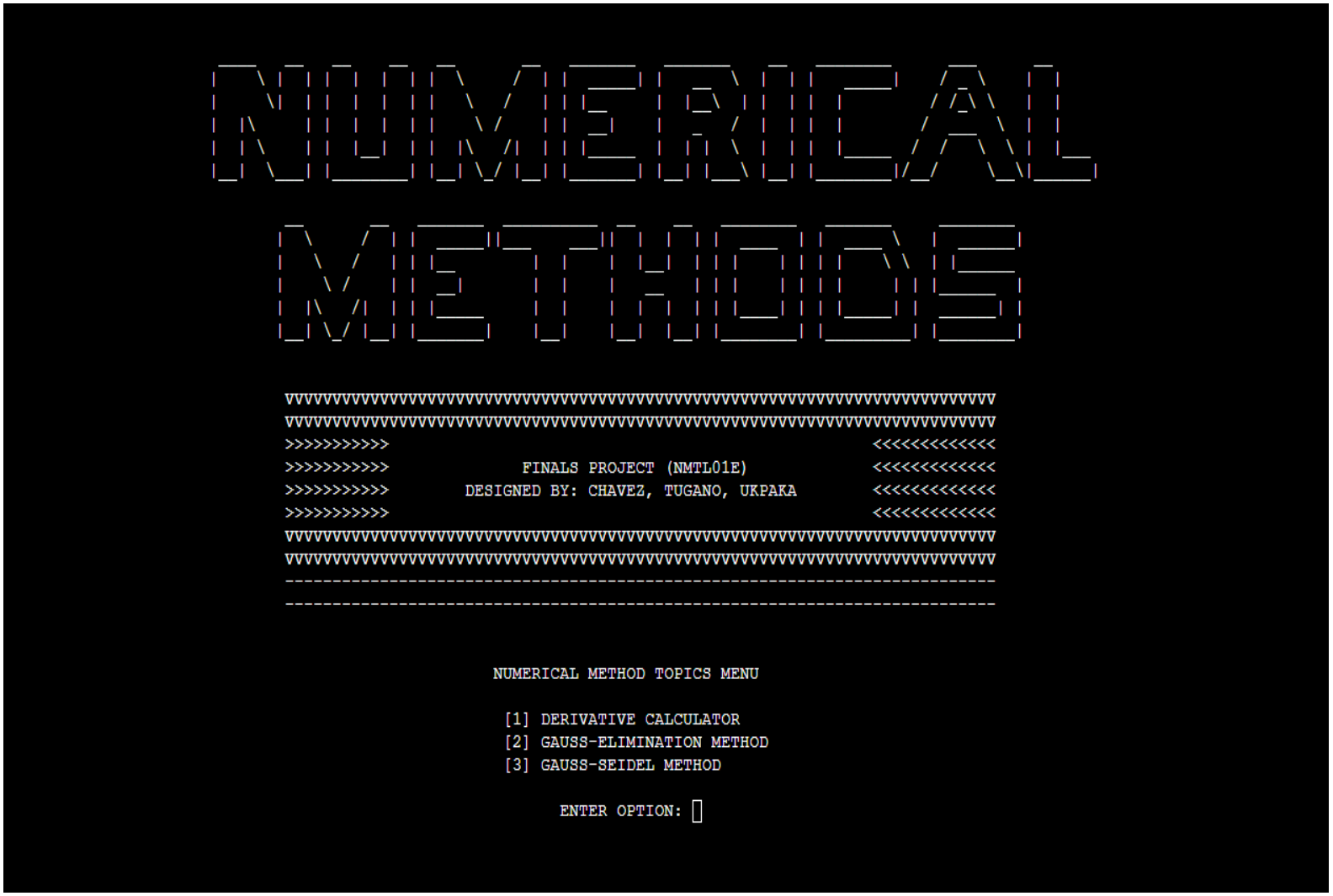
PROGRAM OUTPUT SCREENSHOT

1. **START/MAIN MENU (FRONT PAGE)**



2. Derivative Calculator (Prelim Topic)

```
VVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVV
VVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVV
>>>>>>>>>>>                                                    <<<<<<<<<<<<<
>>>>>>>>>>>               DERIVATIVE CALCULATOR                 <<<<<<<<<<<<<
>>>>>>>>>>>                                                    <<<<<<<<<<<<<
VVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVV
VVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVV

Input 1st term literal coefficient: 5
Input the 1st term exponent: 4
Input 2nd term literal coefficient: 4
Input the 2nd term exponent: 3
Input 3rd term literal coefficient: -8
Input the 3rd term exponent: 2
Input 4th term literal coefficient: -2
Input the 4th term exponent: 1
Input 5th term literal coefficient: 0
Input the 5th term exponent: 0


===================================================
f(x) = 5x^4  4x^3  -8x^2  -2x^1  -2x^0

F(x) or d/dx = 20x^3  12x^2  -16x^1  -2x^0  -0x^-1
===================================================



 Press [S] to go to START MENU.
 Press [Q] to QUIT.
```

3. Gauss-Elimination Method (Midterm Topic)

```
                    VVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVV
                    VVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVV
                    >>>>>>>>>>>                                                    <<<<<<<<<<<
                    >>>>>>>>>>>          GAUSS-ELIMINATION METHOD                  <<<<<<<<<<<
                    >>>>>>>>>>>                                                    <<<<<<<<<<<
                    VVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVV
                    VVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVV


How many equations do you want to solve? : 3

IMPORTANT NOTES FOR THIS SECTION:
----> Please use a 'SINGLE' space for every value to be used.
----> Press ENTER after each equation.
----> Kindly refer to the sample equation format below.

Sample format for the Matrix Equation to be solved (Sample for 3x3 Matrix Only)
 Elem1  Elem2   Elem3  | Elem4
 Elem5  Elem6   Elem7  | Elem8
 Elem9  Elem10  Elem11 | Elem12

Input the elements of Augmented Matrix in a ROW Form:
1 1 -1 7
1 -1 2 3
2 1 1 9

The New/Latest Matrix in the Row-Echelon Form:
2.0        1.0        1.0        9.0
0.0        0.5       -1.5        2.5
0.0        0.0       -3.0        6.0


Variables' Equivalent Values:
============================================
 Solution: (x, y, z)  =  6.0   -1.0   -2.0
============================================



 Press [S] to go to START MENU.
 Press [Q] to QUIT.
```

4. Gauss-Seidel Method (Final Topic)

```
                    VVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVV
                    VVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVV
                    >>>>>>>>>>>                                                    <<<<<<<<<<<<
                    >>>>>>>>>>>              GAUSS-SEIDEL METHOD                   <<<<<<<<<<<<
                    >>>>>>>>>>>                                                    <<<<<<<<<<<<
                    VVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVV
                    VVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVV

Enter the Element for [0,0]: 5
Enter the Element for [0,1]: -1
Enter the Element for [0,2]: 2
Enter the Element for [1,0]: 3
Enter the Element for [1,1]: 8
Enter the Element for [1,2]: -2
Enter the Element for [2,0]: 1
Enter the Element for [2,1]: 1
Enter the Element for [2,2]: 4

Enter the Constants to the Right Side of Equation
Enter values no. [0]: 12
Enter values no. [1]: -25
Enter values no. [2]: 6

Enter the Initial Values of x
Enter values no. [0]: 0
Enter values no. [1]: 0
Enter values no. [2]: 0

Enter the Number of Iterations: 4

============================================
x1 = 2.4   x2 = -4.0   x3 = 1.9
x1 = 0.8   x2 = -3.0   x3 = 2.0
x1 = 1.0   x2 = -3.0   x3 = 2.0
x1 = 1.0   x2 = -3.0   x3 = 2.0
============================================




 Press [S] to go to START MENU.
 Press [Q] to QUIT.
```

5. User Prompt to Continue (While Loop)

```
Do You Really Want to Quit [Y/N]? : y

Hope you've enjoyed the program! Thank you very much for using Numerical Methods Calculator!

...Program finished with exit code 0
Press ENTER to exit console.
```

THE SOURCE CODES

```
#include <iostream>

#include <stdlib.h>

#include <iomanip>

#include <math.h>


using namespace std;


double cf1,cf2, cf3, cf4, cf5, exp_1, exp_2, exp_3, exp_4, exp_5;

int main(void)

{

   mainMenu:

   cout << endl << endl;

   cout << setw(135) << " ____  __  __  __  __    __  _______  _______  __  ________    ___    __
\n";

   cout << setw(135) << "|   \\ | | | | | | \\   / | | _____| |  __ \\ | | | |  _____|  / _ \\   | |   \n";

   cout << setw(135) << "|    \\| | | | | | |  \\ /  | | |__   | |__\\ | | | | | |      / /_\\ \\  | |   \n";

   cout << setw(135) << "| |\\   | | | | | | |   \\/   | | __|  |  _  / | | | | |     / ___ \\ | |   \n";

   cout << setw(135) << "| | \\  | | |__| | | |\\  /| | | |_____ | | | \\ | | | |_____ / /   \\ \\ | |___ \n";
```

```
cout << setw(135) << "|__|   \\___|  |________|  |__|  \\_/  |__|  |_______|  |__|  |___\\  |__| |________|/__/    \\__\\|______|\n";

cout << endl;


cout << setw(129) << " __      __  _______  __________  __    __  ________  _______    ________  \n";

cout << setw(129) << "|  \\    /  | |  _____||___   ___||  |  |  | |  ____  | |  ____ \\  |  ______|  \n";

cout << setw(129) << "|  \\  /  | | |__      | |    |  |__|  | | |    | | | |   \\ \\ | |______   \n";

cout << setw(129) << "|   \\ /   | |  __|      | |    |  __   | | |    | | | |    | | |______  |  \n";

cout << setw(129) << "|  |\\  /|  | | |_____    | |    |  |  |  | | |____| | | |_____| |  ______| |  \n";

cout << setw(129) << "|__| \\_/ |__| |_______|     |__|     |__|  |__| |________| |_________| |________|  \n";


cout << "\n\n\t\t\t\t\t\tVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVV\n";

cout << "\t\t\t\t\t\tVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVV";

cout << "\n\t\t\t\t\t\t>>>>>>>>>>>>                                    <<<<<<<<<<<<<<";

cout << "\n\t\t\t\t\t\t>>>>>>>>>>>>          FINALS PROJECT (NMTL01E)          <<<<<<<<<<<<<<";

cout << "\n\t\t\t\t\t\t>>>>>>>>>>>>      DESIGNED BY: CHAVEZ, TUGANO, UKPAKA       <<<<<<<<<<<<<<";

cout << "\n\t\t\t\t\t\t>>>>>>>>>>>>                                    <<<<<<<<<<<<<<";

cout << "\n\t\t\t\t\t\tVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVV";

cout << "\n\t\t\t\t\t\tVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVV";

cout << "\n\t\t\t\t\t\t------------------------------------------------------------------------\n";

cout << "\t\t\t\t\t\t------------------------------------------------------------------------";

cout<<"\n\n\n";
```

```
   cout<<setw(101)<< "NUMERICAL METHOD TOPICS MENU \n\n";

   cout<<setw(98)<< "[1] DERIVATIVE CALCULATOR \n";

   cout<<setw(101)<< "[2] GAUSS-ELIMINATION METHOD \n";

   cout<<setw(96)<< "[3] GAUSS-SEIDEL METHOD \n";


   int menuOption;

   char option_SQ, yes_or_no;

   cout << endl;

   cout<<" "<<setw(90)<<"ENTER OPTION: ";

   cin>>menuOption;

   system("clear");


   switch(menuOption){

//**********************************************************************************
**************************************//

      case 1:

         {

            cout                                                                    <<
"\n\n\t\t\t\t\t\tVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVV
VVVVVVVVVVVV\n";

            cout                                                                    <<
"\t\t\t\t\t\tVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVV
VVVVVVVVV";

            cout << "\n\t\t\t\t\t\t>>>>>>>>>>>>                         <<<<<<<<<<<<<";

            cout << "\n\t\t\t\t\t\t>>>>>>>>>>>>       DERIVATIVE CALCULATOR       <<<<<<<<<<<<<";

            cout << "\n\t\t\t\t\t\t>>>>>>>>>>>>                         <<<<<<<<<<<<<";

            cout                                                                    <<
"\n\t\t\t\t\t\tVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVV
VVVVVVVVVV";
```

```
	cout << "\n\t\t\t\t\t\tVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVV\n";

	cout << endl;


	cout << "Input 1st term literal coefficient: ";

	cin >> cf1;

	cout << "Input the 1st term exponent: ";

	cin >> exp_1;


	cout << "Input 2nd term literal coefficient: ";

	cin >> cf2;

	cout << "Input the 2nd term exponent: ";

	cin >> exp_2;


	cout << "Input 3rd term literal coefficient: ";

	cin >> cf3;

	cout << "Input the 3rd term exponent: ";

	cin >> exp_3;


	cout << "Input 4th term literal coefficient: ";

	cin >> cf4;

	cout << "Input the 4th term exponent: ";

	cin >> exp_4;


	cout << "Input 5th term literal coefficient: ";

	cin >> cf5;

	cout << "Input the 5th term exponent: ";

	cin >> exp_5;
```

```
        cout << "\n\n================================================";


        cout << "\nf(x) = " <<
        cf1 << "x^" << exp_1 << "  " <<
        cf2 << "x^" << exp_2 << "  " <<
        cf3 << "x^" << exp_3 << "  " <<
        cf4 << "x^" << exp_4 << "  " <<
        cf4 << "x^" << exp_5;


        cout << "\n\nF(x) or d/dx = " <<
        cf1*exp_1 << "x^" << exp_1 - 1 << "  " <<
        cf2*exp_2 << "x^" << exp_2 - 1 << "  " <<
        cf3*exp_3 << "x^" << exp_3 - 1 << "  " <<
        cf4*exp_4 << "x^" << exp_4 - 1 << "  " <<
        cf4*exp_5 << "x^" << exp_5 - 1;



        cout << "\n================================================";
        break;
      }


//*********************************************************************************
************************************//
    case 2:
      {
```

```
	cout << "\n\n\t\t\t\t\t\tVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVV\n";

	cout << "\t\t\t\t\t\tVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVV";

	cout << "\n\t\t\t\t\t\t>>>>>>>>>>>>                              <<<<<<<<<<<<<<";

	cout << "\n\t\t\t\t\t\t>>>>>>>>>>>>        GAUSS-ELIMINATION METHOD        <<<<<<<<<<<<<<";

	cout << "\n\t\t\t\t\t\t>>>>>>>>>>>>                              <<<<<<<<<<<<<<";

	cout << "\n\t\t\t\t\t\tVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVV";

	cout << "\n\t\t\t\t\t\tVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVV\n";

	cout << endl;


	int eqNum, x, y, z;


	cout << "\nHow many equations do you want to solve? : ";

	cin >> eqNum;


	cout << "\nIMPORTANT NOTES FOR THIS SECTION:\n";

	cout << "----> Please use a 'SINGLE' space for every value to be used. \n";

	cout << "----> Press ENTER after each equation.\n";

	cout << "----> Kindly refer to the sample equation format below.\n\n";


	cout << "Sample format for the Matrix Equation to be solved (Sample for 3x3 Matrix Only)\n";

	cout << " Elem1  Elem2   Elem3   | Elem4 \n";

	cout << " Elem5  Elem6   Elem7   | Elem8 \n";

	cout << " Elem9  Elem10  Elem11 | Elem12 \n\n";
```

```
cout << "Input the elements of Augmented Matrix in a ROW Form: \n";


float a[eqNum][eqNum+1], c[eqNum];


cout.precision(1);      //for the decimal places
cout.setf(ios::fixed);


for (x=0; x < eqNum; x++)
{
   for (y=0; y<=eqNum; y++)
   {
      cin >> a[x][y];
   }
}


for (x=0; x<eqNum; x++)
{
   for (z=x+1; z<eqNum; z++)
   {
      if ((a[x][x]) < a[z][x])
         for (y=0; y<=eqNum; y++)
         {
            double temp = a[x][y];
            a[x][y] = a[z][y];
            a[z][y] = temp;
         }
   }
```

```
}

for (x=0; x<eqNum-1; x++)
{
   for (z=x+1; z<eqNum; z++)
   {
      double t = a[z][x] / a[x][x];
      for (y=0; y<=eqNum; y++)
      {
         a[z][y] = a[z][y] - t*a[x][y];
      }
   }
}

cout << "\nThe New/Latest Matrix in the Row-Echelon Form: \n";
for (x=0; x<eqNum; x++)
{
   for (y=0; y<=eqNum; y++)
   {
      cout << a[x][y] << setw(12);
   }
   cout << "\n";
}

for (x=eqNum-1; x>=0; x--)
{
   c[x] = a[x][eqNum];
   for (y=x+1; y<eqNum; y++)
```

```
          {
            if (y != x)
              c[x] = c[x] - a[x][y]*c[y];
          }
          c[x] = c[x] / a[x][x];
        }


        cout << "\n\nVariables' Equivalent Values: \n";


        cout << "================================================\n";
        cout << " Solution: (x, y, z)  = ";
        for (x=0; x<eqNum; x++)
        {
          cout << " " << c[x] << "  ";
        }
        cout << "\n================================================\n";


        break;
      }



//*************************************************************************************
**************************************//
    case 3:
      {
        cout                                                                                     <<
"\n\n\t\t\t\t\tVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVV
VVVVVVVVVVVVV\n";
```

```
    cout <<
"\t\t\t\t\t\tVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVV
VVVVVVVV";

    cout << "\n\t\t\t\t\t\t>>>>>>>>>>>>                    <<<<<<<<<<<<<<";

    cout << "\n\t\t\t\t\t\t>>>>>>>>>>>>      GAUSS-SEIDEL METHOD      <<<<<<<<<<<<<<";

    cout << "\n\t\t\t\t\t\t>>>>>>>>>>>>                    <<<<<<<<<<<<<<";

    cout <<
"\n\t\t\t\t\t\tVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVV
VVVVVVVVVV";

    cout <<
"\n\t\t\t\t\t\tVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVV
VVVVVVVVVV\n";

    cout << endl;


    float a[3][3], b[3], x[3], y[3];

    int i = 0, j = 0, m = 0, n = 3;


    for (i = 0; i < n; i++)

    {

      for (j = 0; j < n; j++)

      {

        cout << "Enter the Element for [" << i << "," << j << "]: ";

        cin >> a[i][j];

      }

    }


    cout << "\nEnter the Constants to the Right Side of Equation\n";

    for (i = 0; i < n; i++)

    {

      cout << "Enter values no. ["<<i<<"]: ";
```

```
    cin >> b[i];
}

cout << "\nEnter the Initial Values of x\n";
for (i = 0; i < n; i++)
    {
        cout << "Enter values no. ["<<i<<"]: ";
        cin >> x[i];
    }

cout << "\nEnter the Number of Iterations: ";
cin >> m;

cout << "\n================================================\n";
while (m > 0)
{
    for (i = 0; i < n; i++)
        {
            y[i] = (b[i] / a[i][i]);
            for (j = 0; j < n; j++)
            {
                if (j == i)
                continue;
                y[i] = y[i] - ((a[i][j] / a[i][i]) * x[j]);
                x[i] = y[i];

            }
            cout << "x" << i + 1 << " = " << y[i] << "    ";
```

```
            }


            cout << "\n";
            m--;


        }
        cout << "==========================================\n\n\n";


        break;
      }


      break;


//*************************************************************************************
************************************//
    default:
      cout<<"\n";
      cout<<" "<<setw(81)<<"Invalid Option. Please Enter Options 1-3 Only!";
      goto mainMenu;
      system ("clear");
      break;
    }


//*************************************************************************************
************************************//
    cout << endl << endl;
```

```
    while (true)
    {
       cout <<"\n Press [S] to go to START MENU. ";
       cout <<"\n Press [Q] to QUIT. ";
       cin>>option_SQ;

       if (option_SQ == 'S' || option_SQ == 's')
       {
          system ("clear");
          goto mainMenu;
       }
       else if (option_SQ == 'Q' || option_SQ =='q')
       {
          system ("clear");
          cout<<"\n";
          cout<<" "<<setw(10)<<"Do You Really Want to Quit [Y/N]? : ";
          cin>>yes_or_no;
          if (yes_or_no == 'Y' || yes_or_no == 'y')
          {
             cout<<" "<<"\n Hope you've enjoyed the program! Thank you very much for using Numerical
Methods Calculator!";
             return 0;
          }
          else if (yes_or_no == 'N' || yes_or_no == 'n')
          {
             system ("clear");
             goto mainMenu;
          }
```

```
        }


        else
        {
           cout<<"INVALID INPUT! Please choose between [S] or [Q] only.\n";
        }


     }
  return 0;
}
```

ONLINE COMPILER USED:

onlinegdb.com