So I wrote this piece of code for solving a system of linear equations using Gauss-Seidel's Iterative method in the fifth semester of my undergraduate course for my Numerical Analysis Class. Hope you guys find it useful.

```
//Gaus-seidel (Written by: Manas Sharma - University of Delhi)
#include<iostream>
#include<iomanip>
#include<cmath>
using namespace std;
int main()
{
    cout.precision(4);
    cout.setf(ios::fixed);
    int n,i,j,k,flag=0,count=0;
    cout<<"\nEnter the no. of equations\n";
    cin>>n;                     //Input no. of equations
    double a[n][n+1];            //declare a 2d array for storing the elements of the
augmented matrix
    double x[n];                //declare an array to store the values of variables
    double eps,y;
    cout<<"\nEnter the elements of the augmented matrix row-wise:\n";
    for (i=0;i<n;i++)
        for (j=0;j<=n;j++)
            cin>>a[i][j];
    cout<<"\nEnter the initial values of the variables:\n";
    for (i=0;i<n;i++)
        cin>>x[i];
    cout<<"\nEnter the accuracy upto which you want the solution:\n";
    cin>>eps;
    for (i=0;i<n;i++)                   //Pivotisation(partial) to make the equations
diagonally dominant
        for (k=i+1;k<n;k++)
            if (abs(a[i][i])<abs(a[k][i]))
                for (j=0;j<=n;j++)
                {
                    double temp=a[i][j];
                    a[i][j]=a[k][j];
                    a[k][j]=temp;
                }
    cout<<"Iter"<<setw(10);
    for(i=0;i<n;i++)
        cout<<"x"<<i<<setw(18);
    cout<<"\n-------------------------------------------------------------------------";
    do                           //Perform iterations to calculate x1,x2,...xn
    {
        cout<<"\n"<<count+1<<"."<<setw(16);
        for (i=0;i<n;i++)               //Loop that calculates x1,x2,...xn
        {
            y=x[i];
            x[i]=a[i][n];
            for (j=0;j<n;j++)
            {
```

```
                if (j!=i)
                x[i]=x[i]-a[i][j]*x[j];
            }
            x[i]=x[i]/a[i][i];
            if (abs(x[i]-y)<=eps)            //Compare the ne value with the last value
                flag++;
            cout<<x[i]<<setw(18);
        }
        cout<<"\n";
        count++;
    }while(flag<n);                         //If the values of all the variables don't
differ from their previious values with error more than eps then flag must be n and
hence stop the loop
    cout<<"\n The solution is as follows:\n";
    for (i=0;i<n;i++)
        cout<<"x"<<i<<" = "<<x[i]<<endl;        //Print the contents of x[]
    return 0;
}
```

```
Enter the no. of equations
3

Enter the elements of the augmented matrix row-wise:
27      6       -1      85
6       15      2       72
1       1       54      110

Enter the initial values of the variables:
0       0       0

Enter the accuracy upto which you want the solution:
0.0001
Iter          x0                  x1                  x2
-------------------------------------------------------------------
1.          3.1481            3.5407            1.9132

2.          2.4322            3.5720            1.9258

3.          2.4257            3.5729            1.9260

4.          2.4255            3.5730            1.9260

5.          2.4255            3.5730            1.9260

 The solution is as follows:
x0 = 2.4255
x1 = 3.5730
x2 = 1.9260
```

Sample Output

```
Enter the no. of equations
4

Enter the elements of the augmented matrix row-wise:
10      -2      -1      -1      3
-2      10      -1      -1      15
-1      -1      10      -2      27
-1      -1      -2      10      -9

Enter the initial values of the variables:
0       0       0       0

Enter the accuracy upto which you want the solution:
.001
Iter         x0                x1                x2                x3
-------------------------------------------------------------------------
1.          0.3000            1.5600            2.8860           -0.1368

2.          0.8869            1.9523            2.9566           -0.0248

3.          0.9836            1.9899            2.9924           -0.0042

4.          0.9968            1.9982            2.9987           -0.0008

5.          0.9994            1.9997            2.9998           -0.0001

6.          0.9999            1.9999            3.0000           -0.0000

 The solution is as follows:
0.9999
1.9999
3.0000
-0.0000
```

Sample Output

More Resources:
More programs on Numerical Analysis:
http://www.bragitoff.com/2015/11/numerical-analysis-c-programs-for-various-techniques/
Lab Write-Up(with Algorithm and Flow-Chart):
http://www.bragitoff.com/2015/10/gauss-seidel-lab-write-up-with-algorithm-and-flowchart/
Video Explaining the above code:

http://equation-solver.org/
https://en.wikipedia.org/wiki/Equation

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I’m a physicist specializing in computational material science with a PhD in Physics from Friedrich-Schiller University Jena, Germany. I write efficient codes for simulating light-matter interactions at atomic scales. I like to develop Physics, DFT, and Machine Learning related apps and software from time to time. Can code in most of the popular languages. I like to share my knowledge in Physics and applications using this Blog and a YouTube channel.

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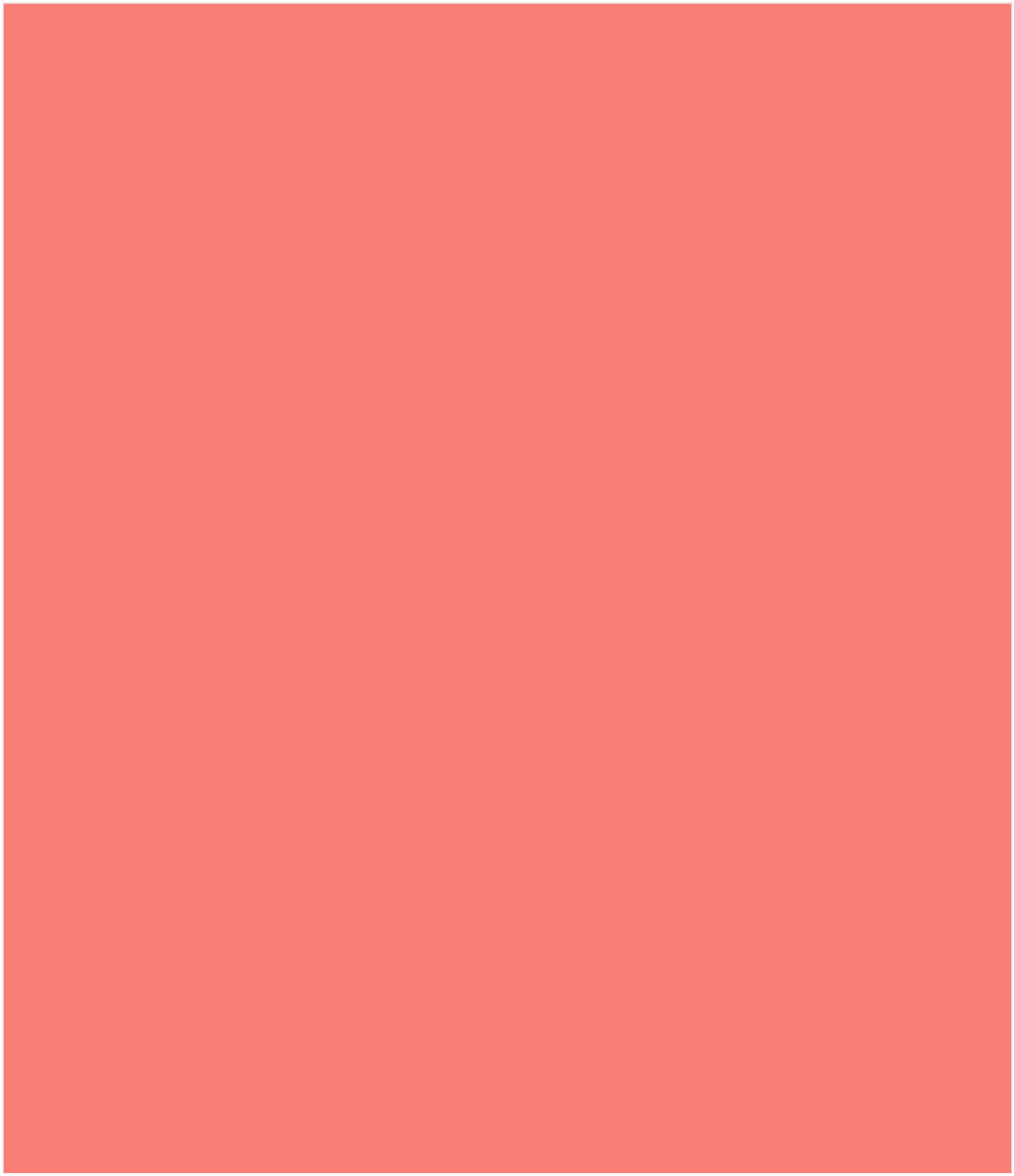

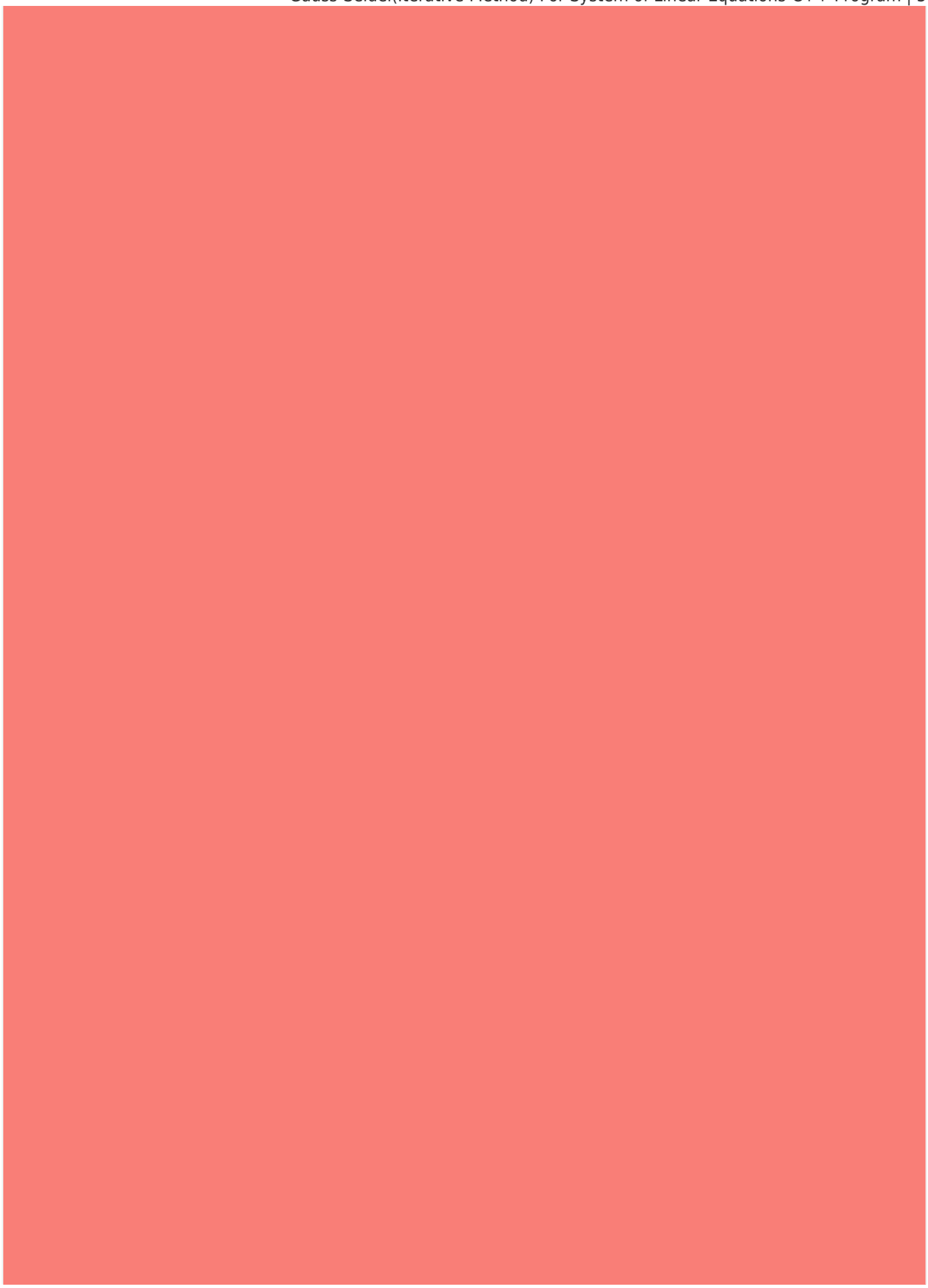

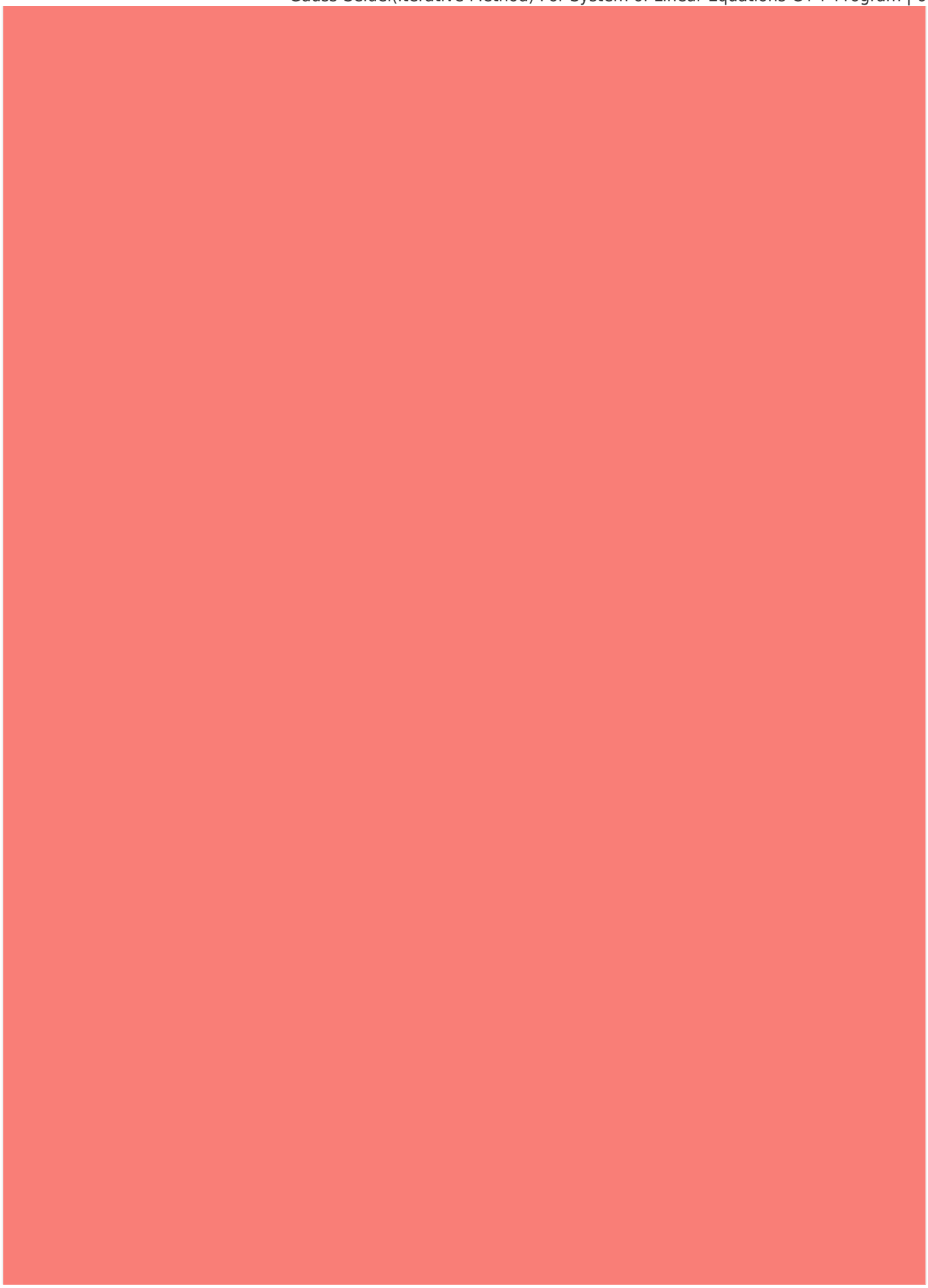

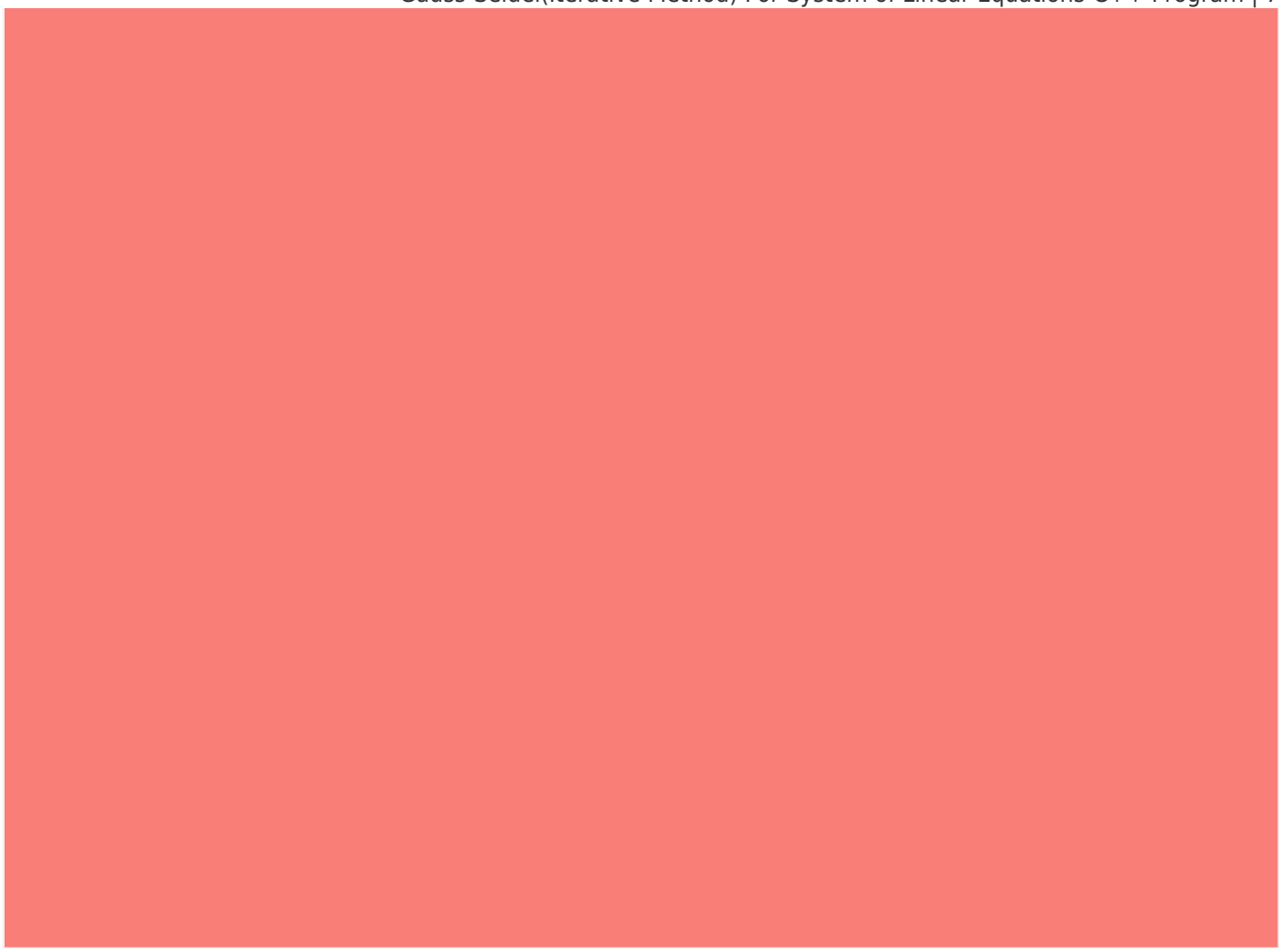

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