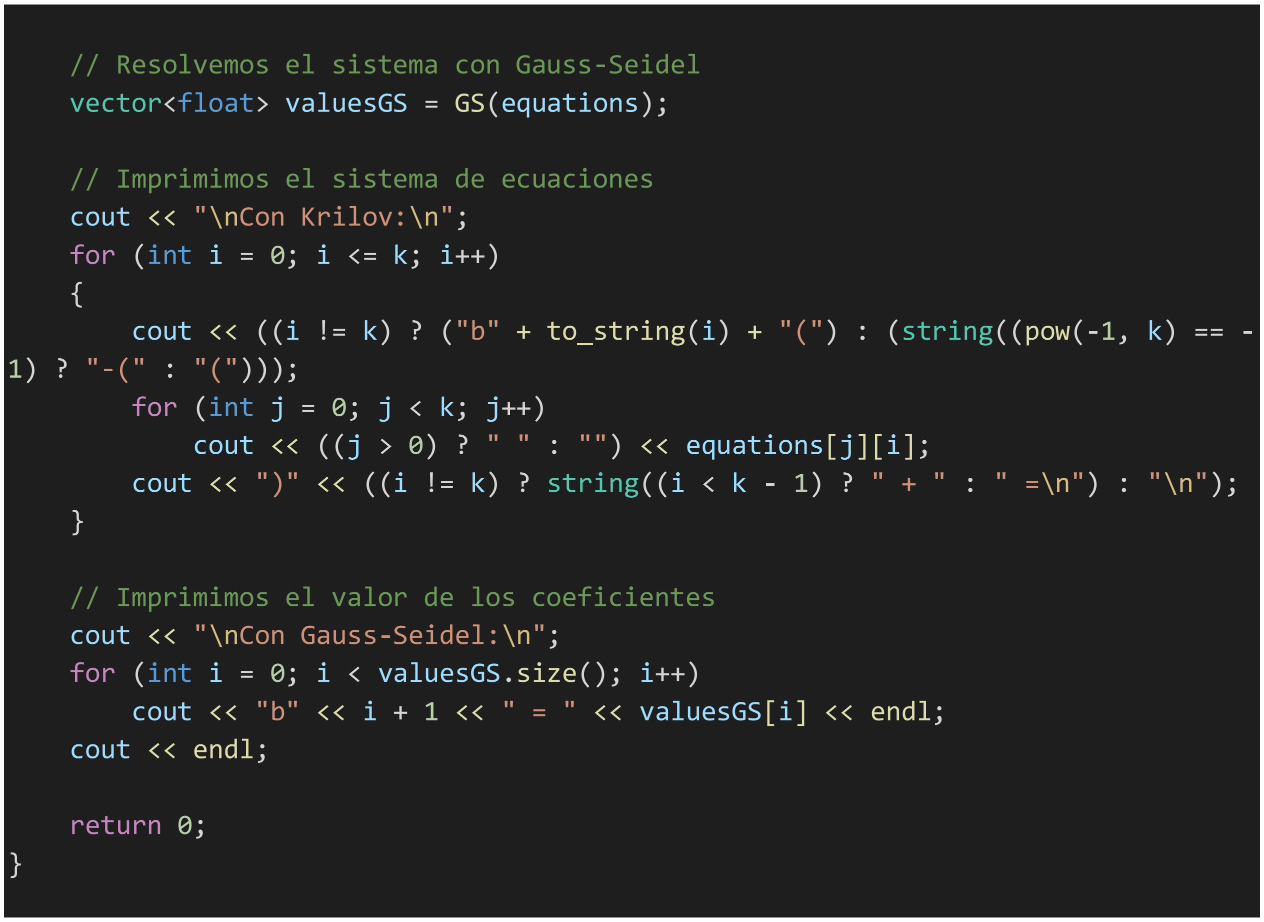
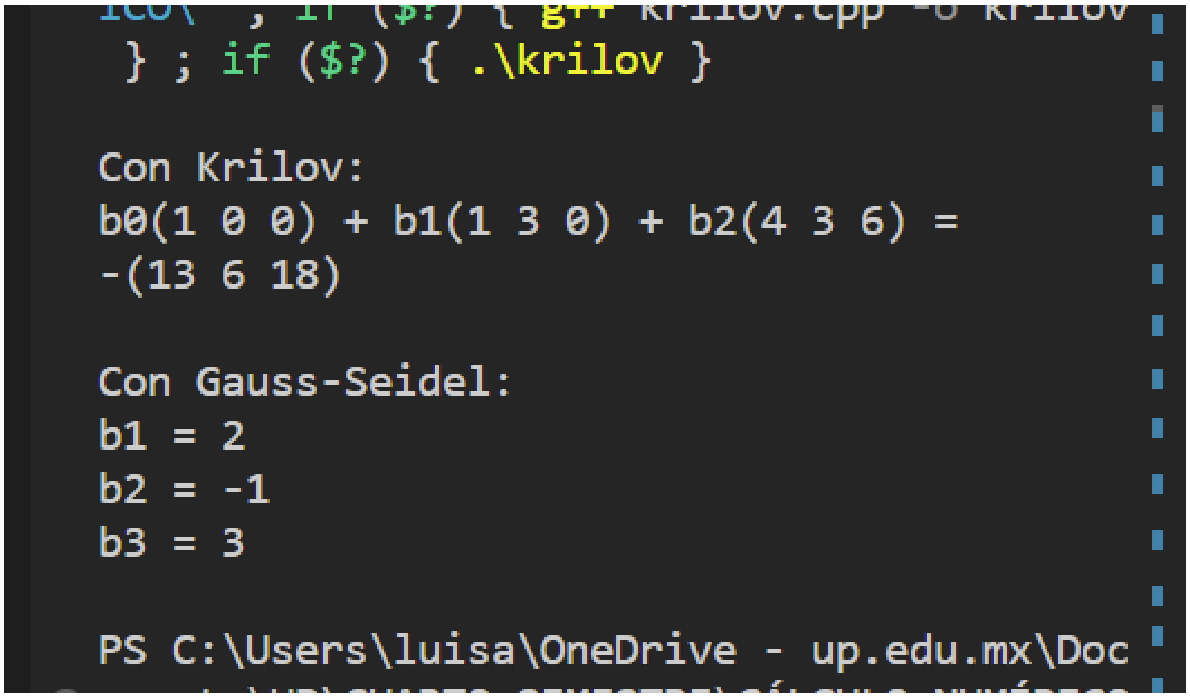
```cpp
#include <iostream>
#include <vector>
#include <math.h>
#include <numeric>
#include <string>

using namespace std;

vector<vector<float>> krilov(vector<vector<float>> A, vector<float> x, int k)
{
    vector<vector<float>> result(k, vector<float>(k + 1));

    // Fill first column with initial vector x
    for (int i = 0; i < k; i++)
        result[i][0] = x[i];

    // Fill remaining columns with matrix-vector products
    for (int j = 1; j <= k; j++)
    {
        for (int i = 0; i < k; i++)
        {
            float sum = 0;
            for (int l = 0; l < k; l++)
                sum += A[i][l] * result[l][j - 1];
            result[i][j] = sum;
        }
    }

    return result;
}

vector<float> GS(vector<vector<float>> equations)
{
    vector<float> result(equations.size());
    vector<float> previousResult(equations.size());
    float error, sumResults = 0, sumPrevResults = 0;

    do
    {
        for (int i = 0; i < result.size(); i++)
        {
            previousResult[i] = result[i];
            result[i] = equations[i][equations[0].size() - 1];
            for (int j = 0; j < result.size(); j++)
            {
                if (i != j)
                    result[i] -= (result[j] * equations[i][j]);
            }
            result[i] /= equations[i][i];
        }

        sumResults = accumulate(result.begin(), result.end(), 0);
        sumPrevResults = accumulate(previousResult.begin(), previousResult.end(),
0);
        error = abs((sumResults - sumPrevResults) / sumResults);
    } while (error > 0.00001);

    return result;
}

void printMatrix(vector<vector<float>> matrix)
{
    for (int i = 0; i < matrix.size(); i++)
    {
        for (int j = 0; j < matrix[i].size(); j++)
            cout << matrix[i][j] << " ";
        cout << endl;
    }
}

// Funcion para ver sis la matriz es diagonalmente dominante
bool isDiagonallyDominant(vector<vector<float>> A)
{
    int n = A.size();
    for (int i = 0; i < n; i++)
    {
        float diagonal = abs(A[i][i]);
        float sum = 0;
        for (int j = 0; j < n; j++)
        {
            if (i != j)
            {
                sum += abs(A[i][j]);
            }
        }
        if (diagonal <= sum)
        {
            return false;
        }
    }
    return true;
}

// Función para convertir una matriz en diagonalmente dominante
void makeDiagonallyDominant(vector<vector<float>> &A)
{
    int n = A.size();
    for (int i = 0; i < n; i++)
    {
        float maxVal = abs(A[i][i]);
        int maxIdx = i;
        for (int j = i + 1; j < n; j++)
        {
            if (abs(A[j][i]) > maxVal)
            {
                maxVal = abs(A[j][i]);
                maxIdx = j;
            }
        }
        // Intercambia la fila actual con la fila que contiene el elemento máximo
        if (maxIdx != i)
        {
            swap(A[i], A[maxIdx]);
        }
    }
}

// Función que convierte una matriz en diagonalmente dominante si es posible
bool convertToDiagonallyDominant(vector<vector<float>> &A)
{
    if (isDiagonallyDominant(A))
    {
        // La matriz ya es diagonalmente dominante, no hace falta hacer nada
        return true;
    }
    // Intenta hacer la matriz diagonalmente dominante
    makeDiagonallyDominant(A);
    if (isDiagonallyDominant(A))
    {
        return true;
    }
    // La matriz no se pudo convertir en diagonalmente dominante
    return false;
}

int main()
{
    vector<vector<float>> A = {
        {1, 1, 1},
        {0, 2, 2},
        {3, -1, 0}};
    vector<float> x = {1, 0, 0};
    int k = 3;

    // Usamos Krilov para obtener el sistema de ecuaciones
    vector<vector<float>> equations = krilov(A, x, k);
    convertToDiagonallyDominant(equations);
```



```
    // Resolvemos el sistema con Gauss-Seidel
    vector<float> valuesGS = GS(equations);

    // Imprimimos el sistema de ecuaciones
    cout << "\nCon Krilov:\n";
    for (int i = 0; i <= k; i++)
    {
        cout << ((i != k) ? ("b" + to_string(i) + "(") : (string((pow(-1, k) == -
1) ? "-(" : "(")));
        for (int j = 0; j < k; j++)
            cout << ((j > 0) ? " " : "") << equations[j][i];
        cout << ")" << ((i != k) ? string((i < k - 1) ? " + " : " =\n") : "\n");
    }

    // Imprimimos el valor de los coeficientes
    cout << "\nCon Gauss-Seidel:\n";
    for (int i = 0; i < valuesGS.size(); i++)
        cout << "b" << i + 1 << " = " << valuesGS[i] << endl;
    cout << endl;

    return 0;
}
```



```
ico\" ; if ($?) { g++ krilov.cpp -o krilov
 } ; if ($?) { .\krilov }

Con Krilov:
b0(1 0 0) + b1(1 3 0) + b2(4 3 6) =
-(13 6 18)

Con Gauss-Seidel:
b1 = 2
b2 = -1
b3 = 3

PS C:\Users\luisa\OneDrive - up.edu.mx\Doc
```