**Exercises**

(1) Use Jacobi’s method to solve the following system of equations, with $x^{(0)} = (1, 1, 1)^T$ as initial approximation, correct to 2 significant figures.

\[
\begin{align*}
    x - 10y + 3z &= 39 \\
    10x - 2y - 5z &= 26 \\
    4x - 5y + 10z &= 47
\end{align*}
\]

What is the minimum number of iterations required to get 5 significant digit accuracy, if 5 digit arithmetic is used.

(Ans: True solution $(3, -3, 2)^T$; number of iteration required=36)

(2) Do three iterations of Jacobi’s method to solve

\[
\begin{align*}
    -2x + 3y + 10z &= 22 \\
    10x + 2y + z &= 9 \\
    x + 10y - z &= -22
\end{align*}
\]

with $x^{(0)} = (1, -1, 1)^T$ as starting vector. What is the minimum number of iterations required, so that the solution is correct to 4 decimal places.

(Ans: True solution $(1, -2, 3)^T$; number of iteration required =17)

(3) Solve, by Gauss-Seidal iteration method, the system of linear equations

\[
\begin{align*}
    3x + 9y - 2z &= 11 \\
    4x + 2y + 13z &= 24 \\
    4x - 2y + z &= -8
\end{align*}
\]

correct up to four significant figures.

(Ans: $x = -1.423, y = 2.131, z = 1.956$)
(4) Compute the solution of the system of linear equations by Gauss-Seidal iteration method

\[
\begin{align*}
6.7x + 1.1y + 2.2z &= 20.5 \\
3.1x + 9.4y - 1.5z &= 22.9 \\
2.1x - 1.5y + 8.4z &= 28.8
\end{align*}
\]
correct up to 3-significant figures.

(Ans: \( x = 1.50, \ y = 2.50, \ z = 3.50 \))

(5) Do five iterations of each Jacobi’s and Gauss Seidel method to solve

\[
\begin{align*}
2x + 3y + 7z &= 16 \\
3x + y + z &= 6 \\
x + 5y + 3z &= 10
\end{align*}
\]
with starting initial guess as \((x, y, z) = (1, 1, 1)\). What is the minimum number of iterations required, so that the solutions correct to 8 significant figures?

(Ans: True solution: \(x = 1.2, \ y = 0.8, \ z = 1.6\))