

```

In[17]:= GaussSeidelWE[A0_, b0_, x0_, error_] :=
Module[{A = N[A0], b = N[b0], xk = X0, xk1, i, j, k = 0, n, m, maxNorm, Output},
  size = Dimensions[A];
  n = size[[1]];
  m = size[[2]];
  Output = {xk};
  If[n ≠ m,
    Print["Not a square matrix , cannot proceed with the Gauss Seidel Method"]];
  maxNorm = 100000;
  xk1 = xk;
  While[maxNorm > error, For[i = 1, i ≤ n, i++,
    xk1[[i]] = (1/A[[i, i]]) *
      (b[[i]] + A[[i, i]] * xk[[i]] - Sum[A[[i, j]] * xk1[[j]], {j, n}]);];
  maxNorm = Max[Abs[xk1 - xk]]; xk = xk1; k++;
  Output = Append[Output, xk];];
  colHeading = Table[X[i], {i, 1, n}];
  Print[NumberForm[TableForm[Output, TableHeadings → {None, colHeading}], 6]];
  Print["Number of iterations taken to achieve desired accuracy = ", k];
  Print["Max Norm at ", k "th iterations = ", maxNorm];];

```

Question 1

```

A = {{5, 1, 2}, {-3, 9, 4}, {1, 2, -7}};
b = {10, -14, -33};
X0 = {0, 0, 0};
error = 10^(-4);
GaussSeidelWE[A, b, X0, error]

```

Out[18]= Question

X[1]	X[2]	X[3]
0	0	0
2.	-0.888889	4.74603
0.279365	-3.57178	3.73369
1.22088	-2.80801	4.08641
0.927039	-3.06272	3.97166
1.02388	-2.97944	4.00929
0.992174	-3.00674	3.99696
1.00256	-2.99779	4.001
0.99916	-3.00072	3.99967
1.00028	-2.99976	4.00011
0.99991	-3.00008	3.99996
1.00003	-2.99997	4.00001
0.99999	-3.00001	4.

Number of iterations taken to achieve desired accuracy = 12

Max Norm at 12 th iterations = 0.0000392312

Question 2

```

In[12]:= A = {{4, 1, 1}, {1, 5, 2}, {1, 2, 3}};
b = {2, -6, -4};
X0 = {0.5, -0.5, -0.5};
error = 10^(-3);
GaussSeidelWE[A, b, X0, error];

```

X[1]	X[2]	X[3]
0.5	-0.5	-0.5
0.75	-1.15	-0.816667
0.991667	-1.07167	-0.949444
1.00528	-1.02128	-0.987574
1.00221	-1.00541	-0.997129
1.00064	-1.00128	-0.999362
1.00016	-1.00029	-0.999862

Number of iterations taken to achieve desired accuracy = 6

Max Norm at 6th iterations = 0.000988245