Name: Yogesh chandra

Roll No:-204081

In[]:=
```
GaussSeidel[A0_, b0_, x0_, maxiter_] :=
  Module[{A = N[A0], b = N[b0], xk = x0, xk1, i, j, k = 0,
    n, m, OutputDetails},
   Size = Dimensions[A];
   n = Size[[1]];
   m = Size[[2]];
   If[n ≠ m, Print["not a square matrix, cannot proceed with Gauss Seidel method"];
    Return[]];
   OutputDetails = {xk};
   xk1 = Table[0, {n}];
   While[k < maxiter,
    For[i = 1, i ≤ n, i++,
     xk1[[i]] =
       1 / A[[i, i]] (b[[i]] - Sum[A[[i, j]] * xk1[[j]], {j, 1, i-1}] - Sum[A[[i, j]] * xk[[j]], {j, i+1, n}]);];
    k++;
    OutputDetails = Append[OutputDetails, xk1];
    xk = xk1;];
   colHeading = Table[x[k], {k, 1, n}];
   Print[
    NumberForm[TableForm[OutputDetails, TableHeadings → {None, colHeading}], 6]];
   Print["Number of iterations performed ", maxiter];];
A = {{5, 1, 2}, {-3, 9, 4}, {1, 2, -7}};
b = {10, -14, -33};
x0 = {0, 0, 0};
GaussSeidel[A, b, x0, 12];
```

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 performed 12

In[]:=
```
A = {{2, -1, 1}, {2, -3, 1}, {1, 3, -4}};
b = {5, 3, 4};
x0 = {1, 2, 3};
GaussSeidel[A, b, x0, 10];
```

x[1]	x[2]	x[3]
1	2	3
2.	1.33333	0.5
2.91667	1.11111	0.5625
2.77431	1.03704	0.471354
2.78284	1.01235	0.45497
2.77869	1.00412	0.447758
2.77818	1.00137	0.445573
2.7779	1.00046	0.444818
2.77782	1.00015	0.444569
2.77779	1.00005	0.444486
2.77778	1.00002	0.444458

Number of iterations performed 10

In[•]:=
```
A = {{3, -6, 2}, {4, -1, 1}, {1, -3, 7}};
b = {14, 2, 22};
x0 = {1, 2, 3};
GaussSeidel[A, b, x0, 10];
```

x[1]	x[2]	x[3]
1	2	3
6.66667	27.6667	14.0476
50.6349	214.587	87.8753
375.258	1586.91	629.637
2758.72	11662.5	4607.26
20258.2	85638.1	33811.1
148740.	628769.	248227.
1.09206×10^{6}	4.61646×10^{6}	1.82248×10^{6}
8.01794×10^{6}	3.38942×10^{7}	1.33807×10^{7}
5.8868×10^{7}	2.48853×10^{8}	9.82414×10^{7}
4.32211×10^{8}	1.82709×10^{9}	7.21292×10^{8}

Number of iterations performed 10

In[•]:=
```
A = {{2, 1, 1}, {3, 5, 2}, {2, 1, 4}};
b = {4, 15, 8};
x0 = {1, 2, 3};
GaussSeidel[A, b, x0, 10];
```

x[1]	x[2]	x[3]
1	2	3
−0.5	2.1	1.725
0.0875	2.2575	1.39188
0.175313	2.33806	1.32783
0.167055	2.36864	1.32431
0.153525	2.37816	1.3287
0.146572	2.38058	1.33157
0.143926	2.38102	1.33278
0.1431	2.38103	1.33319
0.14289	2.38099	1.33331
0.142852	2.38097	1.33333

Number of iterations performed 10