

```

In[ ]:= GaussSeidelWI[A0_, b0_, x0_, maxiter_] :=
Module[{A = N[A0], b = N[b0], xk = x0, i, j, k = 0, n, m, Output},
size = Dimensions[A];
n = size[[1]];
m = size[[2]];
Output = {xk};
If[n ≠ m, Print["Not a square matrix, cannot proceed with Gauss Seidel Method"];
Return[]];
While[k < maxiter, For[i = 1, i ≤ n, i++,
xk[[i]] =
(1/A[[i, i]]) * (b[[i]] + A[[i, i]] * xk[[i]] - Sum[A[[i, j]] * xk[[j]], {j, n}]);];
k++;
Output = Append[Output, xk];];
colHeading = Table[x[i], {i, 1, n}];
Print[NumberForm[TableForm[Output, TableHeadings → {None, colHeading}], 6]];
Print["Number of iterations performed ", maxiter];];

```

### Question 1

```

A = {{5, 1, 2}, {-3, 9, 4}, {1, 2, -7}};
b = {10, -14, -33};
x0 = {0, 0, 0};
GaussSeidelWI[A, b, x0, 12]

```

Out[ ]:= 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 performed 12

### Question 2

```

In[ ]:= A = {{4, 1, 1}, {1, 5, 2}, {1, 2, 3}};
b = {2, -6, -4};
x0 = {0.5, -0.5, -0.5};
GaussSeidelWI[A, b, x0, 8]

```

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
1.00004	-1.00006	-0.999971
1.00001	-1.00001	-0.999994

Number of iterations performed 8

### Question 3

```
In[6]:= A = {{2, -1, 0}, {-1, 2, -1}, {0, -1, 2}};
b = {7, 1, 1};
GaussSeidelWI[A, b, x0, 5]
```

x[1]	x[2]	x[3]
0.5	-0.5	-0.5
3.25	1.875	1.4375
4.4375	3.4375	2.21875
5.21875	4.21875	2.60938
5.60938	4.60938	2.80469
5.80469	4.80469	2.90234

Number of iterations performed 5