**Gauss Jacobi / Jacobian Method:**

**Example 1**:

3x + 20y - z = -18

2x - 3y + 20z = 25

20x + y - 2z = 17

**Assumptions**:

The system of equations has a unique solution

There is no zero entry among the diagonal or pivot elements of the coefficient matrix A.

**Diagonally Dominant Form**:

20x + y - 2z = 17

3x + 20y - z = -18

2x - 3y + 20z = 25

f1 = x = (17-y+2z)/20

f2 = y = (-18-3x+z)/20

f3 = z = (25-2x+3y)/20

Let us assume x=0, y=0, z=0, and try to compute the value of x, y & z.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Initial Assumption | Iteration=1 | Iteration=2 | Iteration=3 | Iteration=4 |
| x | 0.000 | 0.850 | 1.020 | 1.001 | 1.000 |
| y | 0.000 | -0.900 | -0.965 | -1.002 | -1.000 |
| z | 0.000 | 1.250 | 1.030 | 1.003 | 1.000 |

If we assume, x=10, y=10, z=10

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Initial Assumption | Iteration=1 | Iteration=2 | Iteration=3 | Iteration=4 | Iteration=5 |
| x | 10.000 | 1.350 | 1.120 | 0.984 | 1.000 | 1.000 |
| y | 10.000 | -1.900 | -1.015 | -1.027 | -0.998 | -1.000 |
| z | 10.000 | 1.750 | 0.830 | 0.986 | 0.998 | 1.000 |

**Example 2**: (Nov-2022)

10x + y + z = 6

x + 10y + z = 6

x + y + 10z = 6

**Assumptions**:

The system of equations has a unique solution

There is no zero entry among the diagonal or pivot elements of the coefficient matrix A.

**Diagonally Dominant Form**:

10x + y + z = 6

x + 10y + z = 6

x + y + 10z = 6

f1 = x = (6-y-z)/10

f2 = y = (6-x-z)/10

f3 = z = (6-x-y)/10

Let us assume x=0, y=0, z=0, and try to compute the value of x, y & z.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Initial Assumption | Iteration=1 | Iteration=2 | Iteration=3 | Iteration=4 | Iteration=5 |
| x | 0.0000 | 0.6000 | 0.4800 | 0.5040 | 0.4992 | 0.5002 |
| y | 0.0000 | 0.6000 | 0.4800 | 0.5040 | 0.4992 | 0.5002 |
| z | 0.0000 | 0.6000 | 0.4800 | 0.5040 | 0.4992 | 0.5002 |

If we assume, x=10, y=10, z=10

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Initial Assumption | Iteration=1 | Iteration=2 | Iteration=3 | Iteration=4 | Iteration=5 | Iteration=6 |
| x | 10.0000 | -1.4000 | 0.8800 | 0.4240 | 0.5152 | 0.4970 | 0.5006 |
| y | 10.0000 | -1.4000 | 0.8800 | 0.4240 | 0.5152 | 0.4970 | 0.5006 |
| z | 10.0000 | -1.4000 | 0.8800 | 0.4240 | 0.5152 | 0.4970 | 0.5006 |